A SYSTEMATIC REVIEW AND META-ANALYTIC INQUIRY INTO THE EFFECT OF CHILD CARE ON CHILDREN EXPERIENCING POVERTY

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ABSTRACT

Childhood poverty is associated with a range of negative developmental consequences (Brooks-Gunn & Duncan, 1997). Several well-known early childhood intervention programs have demonstrated success in supporting cognitive, language, and behavioural outcomes for children experiencing social disadvantage (Anderson et al., 2003; Barnett, 1995, Ramey & Ramey, 2004). Less known is the impact of naturally occurring centre-based child care programs on developmental outcomes of children living in poverty. A systematic review and meta-analytic inquiry was undertaken to shed light on the potential for child care programs to support developmental outcomes. Of the over 11,000 titles and abstracts reviewed, 226 full documents were subsequently retrieved and reviewed for possibly inclusion, and 25 were ultimately included in the in-depth review. The large degree of heterogeneity in and across these studies, reflecting a variety of child care and outcome measures, precluded combination into a single average effect size. A reduced meta-analytic inquiry into the impact of high quality child care on cognitive-linguistic, social, and behavioural outcomes revealed average effect sizes of g=0.41, g=0.37, and g= -0.36 respectively. High quality child care was associated with improved cognitive-linguistic and social outcomes, and reduced behavioural concerns for children from impoverished backgrounds. Collectively, the systematic review, meta-analytic inquiry, and individual effect size data indicates that child care holds the potential to exert a meaningful and positive influence in the lives of children experiencing poverty under conditions of high structural and process quality. Findings are discussed through the lens of Bronfenbrenner's (1979) ecology of human development.

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DEDICATION

For children growing up in poverty, and those grown children who remember it still.

Had I the heavens' embroidered cloths,
Enwrought with golden and silver light,
The blue and the dim and the dark cloths
Of night and light and the half light,
I would spread the cloths under your feet:
But I, being poor, have only my dreams;
I have spread my dreams under your feet;
Tread softly because you tread on my dreams.

-W.B. Yeats

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OVERVIEW OF CHAPTERS

This thesis is comprised of five chapters. Chapter one is a brief introduction to the study, establishing the context for this research. Child care as a naturally occurring intervention for children experiencing poverty and the associated risks of poverty are situated in the literature review of chapter two, threaded together by Bronfenbrenner's (1979) ecological theory of development. Chapter three presents the methodological approach, and chapter four details the results. Chapter five interprets and integrates results to inform the research questions, and provides conclusions and directions for future research.

CHAPTER ONE: INTRODUCTION

Early childhood education and care ideally represents a system of programmatically inseparable care and early education, universally accessible to children and families (OECD, 2006). While countries with a social-democratic orientation provide universal access to child care within political ideologies that favour family policies, countries with liberal economies consider child care to be a private responsibility, with limited investment in child care (OECD, 2006; Raphael, 2007). Canada is typified as a liberal-welfare state (Raphael, 2007), where education and child care are historically fragmented (Beach, Friendly, Ferns, Prabhu & Forer, 2008).

Child care in Canada is framed within the discourse of poverty, with public investment in the form of child care subsidies for low-income parents to support workforce participation, rather than universal access to child care programs (Ismael, 2006; Raphael, 2007). Although child care offers a means of ameliorating the effects of poverty by supporting parents in educational attainment and employment, quality child care programs nurture the developmental potential of all children (Friendly & Lero, 2002). Child care programs of high quality are of benefit to

children irrespective of socio-economic status, however, quality programs are of particular importance to children experiencing poverty in ensuring positive outcomes (McCartney, Dearing, Taylor, & Bub, 2007).

Canada's poverty rate is increasing steadily, manifested by growing income inequality between upper and lower income classes (OECD, 2008). The developmental consequences of poverty are significant for young children (Raphael, 2007). Poverty is characterized by cumulative risk (Sameroff, Seifer, Baldwin & Baldwin , 1993), evidenced in premature birth, growth stunting, compromised cognition, learning disabilities and externalizing and internalizing behaviours (Brooks-Gunn & Duncan, 1997; Turkheimer, Haley, Waldron, D'Onofrio & Gottesman, 2003). Although children's environments may be impoverished without the experience of economic disadvantage (Kerr, 2004), the nature of risks congregating to a greater degree in homes of low-socioeconomic status threatens developmental outcomes for children living in poverty (Sameroff et al., 1993).

Traditional centre-based early intervention programs for children living in poverty typically involve a combination of care, early childhood education, health and family components (Anderson et al., 2003). Head Start, a two-generation program for impoverished children and their families offering early childhood education to preschool-aged children for an academic year and comprehensive family services to support parenting skills, is the canonical form of centre-based intervention for impoverished children and families (Zigler & Styfco, 2004). Head Start, however, was not envisioned by its founders as a child care program (Zigler & Styfco, 2004). In contrast, within the constellation of early intervention programs developed for young children since the inception of Head Start in 1965, the Abecedarian Project offered intensive full-time educational child care for impoverished children from infancy to age five

(Ramey & Ramey, 2004). The positive effect of early intervention programs tailored for children experiencing poverty on cognitive, academic, language, and societal outcomes have been demonstrated in longitudinal studies (Anderson et al., 2003; Barnett, 1995; Gorey, 2001).

Two elements are essential to the success of early intervention programs: intensity and specificity (Guarlnick, 2004). Intensity refers to the duration of a program, and time spent within a program across its duration. Specificity refers to the degree to which services correspond to needs. The efficacy of the Abecedarian Project, which is simultaneously highly intensive and specific, has been well documented (Ramey & Ramey, 2004). Further, child care programs which have not been contrived as early intervention programs have been advocated as a means of supporting the optimal development of impoverished children (McCartney et al., 2007).

The importance of early childhood education and care experiences is captured by Bronfenbrenner's (1979) ecological theory of human development. The ecology of human development contends that child development occurs within interrelated systems, each concentrically nested within the next. The microsystem of a developing child's quality child care environment instigates both child and parent development, and influences multiple system levels. Within the context of public policies and societal beliefs that favour quality child care, or the macrosystem in the ecological theory of human development, children, families, and educators are well supported.

The theoretical framework of the ecology of human development has been applied to understanding the impact of early intervention programs on children and their families (Garbarino & Ganzel, 2000). Further, the efficacy of centre-based early childhood intervention and has been documented in syntheses and meta-analyses of literature (Anderson et al., 2003; Barnett, 1995; Gorey, 2001). However, less is known specifically about the contribution of child

care on outcomes for impoverished children, translating to a void in the collective knowledge base on the impact of early childhood programs that is produced through synthesized research.

In a systematic review of the effects of integrated care and education on young children, Penn et al. (2004) indicated that the early childhood education and care literature has been generally framed according to three research and policy orientations: day care, educational, and poverty intervention. The day care orientation focuses on the impact of child care arrangements on children of working mothers, the educational orientation on the value of various curricular approaches, and the poverty intervention on the impact of programs targeted to poor families.

These three approaches in the research base are largely mutually exclusive (Penn et al., 2004). The day care perspective examines the impact of "care" within the context of vague definitions of quality to the exclusion of education, while the opposite is evident for the educational orientation. The poverty orientation, according to Penn et al. (2004), generally focuses neither on care nor education, but on support and training programs for impoverished mothers. The systematic review conducted by Penn et al. (2004) challenged the three orientations framing the literature base by examining the impact of integrated care and education specifically, ultimately bridging the three research approaches to determine that seamless care and education benefitted young children, particularly those who are disadvantaged.

Penn et al.'s (2004) systematic review on integrated and care and education adds to the knowledge base by considering the impact of educational child care, a departure from the stance that child care arrangements are solely supervisory, as implied by the "day care" research and policy perspective. Although the research protocol established in the Penn et al. (2004) study did not examine the effects of child care on children in poverty specifically, among the nine studies included in their review, a study examining the effects of the Abcedarian Project (Campbell and

Ramey, 2001) representative of 22 reports related to the project, emerged as a substantial source of information supporting educational child care experiences as beneficial for economically disadvantaged children. This finding of the value of educational child care for children experiencing poverty, however, was a subtext to the greater intent of the study of investigating the impact of integrated care and education on children and their families in general.

In addition, although the Penn et al. (2004) study traverses the three research perspectives commonly found in the literature, the systematic review did not intend to distinguish the impact of early childhood education and care programs developed as intervention programs from community-based programs children typically experience. These typical child care programs arguably represent the vast majority of early education and care experiences available to young, vulnerable children experiencing poverty or near-poverty.

Purpose of the Present Study

In light of the lack of synthesized evidence of the impact of typical child care programs on children experiencing poverty, the present study intends to investigate the impact of these experiences as presented in the published, peer reviewed literature base. Evidence-based practices are increasingly sought through the application of research synthesis (Penn et al., 2004). Within a systematic and meta-analytic inquiry of child care research, evidence concerning the effectiveness of child care programs on child outcomes, and the nature of programs that are of the greatest benefit, may be determined.

To examine the effects of child care programs on child outcomes, a systematic review and statistical meta-analysis will be applied to the following research questions:

1. What is the current state of research in the study of child care as a means of supporting developmental outcomes for children experiencing poverty?
2. Is there an effect of child care on developmental outcomes for impoverished children?
3. What is the magnitude of the effect of child care on developmental outcomes for impoverished children?
4. What are the characteristics of child care programs that support children experiencing poverty?

The present study is significant because previous reviews and meta-analyses have considered child care within the scope of formal early intervention programs that are designed for impoverished children. The unique contribution of child care is less known in meta-analyses of research. The answer to these questions will shed insight into how child care operates as a mechanism for supporting developmental outcomes for children experiencing poverty, and the strength of relationship between child care and child outcomes.

Definitions

The following definitions will apply for the purpose of this thesis.

Child Care

An early childhood education and care program. Early childhood education and care are conceptualised as seamless elements of the same service for children who have not yet entered the compulsory school-system (OECD, 2006). Throughout this thesis, the terms *child care* and *early childhood education and care* will be used interchangeably.

Naturally Occurring Intervention

Child care programs that are not developed as early interventions, or tailored to specific populations of children. Rather, "naturally occurring" implies a program that is experienced by all children regardless of socioeconomic status, but acts as a means of promoting resiliency for children experiencing poverty (McCarteny et al., 2007).

Poverty

Poverty will be framed in terms of the relative social and material deprivation that prevents individuals from experiencing their full potential (Raphael, 2007; Townsend, 1993). As opposed to the absolute poverty experienced by developing nations, poverty will be defined as a phenomenon which although does not threaten life, does impact developmental outcomes (Raphael, 2007).

Quality Child Care

There is no standard definition of child care quality in the literature, however, *quality* may be broadly captured under the umbrella of *developmentally appropriate practice* (Copple & Bredekamp, 2009). Quality child care may be considered a nebulous term used as a summation of characteristics linked to positive child outcomes, and defined by instruments used to measure features of child care programs, most notable of which is the Early Childhood Environment Rating Scale (Harms, Clifford & Cryer, 1998). For the purposes of this thesis, quality will be defined as developmentally appropriate practice as a point of departure, and further examined in consideration of the current state of the child care literature base.

CHAPTER TWO: LITERATURE REVIEW

This chapter reviews relevant literature pertaining to the phenomenon of child care as a naturally occurring intervention for impoverished children. The first section describes various interpretations of poverty and describes its developmental consequences. The second section reviews approaches to early intervention and previous literature syntheses of early intervention programs for impoverished children. Also included in this section is a review of studies exploring child care as a naturally occurring intervention for impoverished children. The third section examines a developmental ecology of child care, and frames child care in current Canadian public policy.

The Experience of Poverty in Childhood

In Canada, as in other developed nations, the experience of poverty is relative to the wealth that enables full participation in society's activities (Raphael, 2007). Relative poverty emerges when individuals and families do not have the resources to "play the roles, participate in the relationships, and follow the customary behavior which is expected of them by virtue of their membership in society" (p.36, Townsend, 1993). Relative poverty is exclusionary, preventing individuals from access to housing, health care, and education, and impedes development across the lifespan (Raphael, 2007).

In contrast, absolute poverty is characterized by severe deprivation, and is the experience of poverty in developing nations (Raphael, 2007). Although there is contention as to whether absolute poverty is a fixed definition representing basic needs for sustenance, Townsend (1993) argues that both absolute poverty and relative poverty are dynamic and experienced in reference to time and place. As such, the experience of absolute poverty is in a sense relative, and can be

measured along the same continuum as relative poverty (Gordon, 2000); the difference between absolute poverty and relative poverty appears to be a matter of degree.

There is no agreed upon measure of poverty (Burtless & Smeeding, 2001), and within Canada, no definition or measure of poverty per se (Raphael, 2007). Rather, in Canada, Low-Income Cutoffs (LICOS) are used to measure financial hardship, however, low-income and poverty are synonymous (Raphael, 2007). The measure of LICO is calculated from the resources available to an average household to provide for the basic necessities of food, clothing, and shelter (Raphael, 2007). If the cost of these basic necessities exceeds 54.7% of pre-tax household income, an individual or family is considered "low-income" or impoverished.

In Canada, poverty is defined by the tacit assumptions underlying "low-income" (Raphael, 2007). Low-income and poverty being conceptually identical, the incidence of poverty among Saskatchewan children is 23.7% overall, and 29.5% for the youngest of children aged 0-2 years (Beach et al., 2008). Equating the experience of poverty with a low-income metric is problematic, however, because it does not explicitly define, explore, or map the consequences of poverty (Townsend, 1993). The LICO does little to elucidate the developmental consequences for many children raised in impoverished environments that inhibit cognitive, emotional, social, and physical growth (Raphael, 2007).

Developmental Consequences of Poverty

Poverty is associated with delayed cognitive development, emotional and behavioural difficulties, and poor physical health (Brooks-Gunn & Duncan, 1997). However, it is important to note that children can experience socioeconomic deprivation without necessarily being impoverished. For example, in a longitudinal study of children living in poverty, and their families, Kerr (2004) examined poverty with respect to three areas of maladaptation:

hyperactivity, emotional distress, and academic challenges. Kerr found that, over time, children living in poverty were not as likely to experience difficulties as was originally hypothesized. Although there was a mild effect of poverty on measures of hyperactivity over the span of the four year study, children's levels of academic problems or emotional instability did not reach levels of statistical significance. Further, there were several moderating variables, with females less likely to experience hyperactivity, or to face difficulties in school than males, and self-reported measures of family quality associated with higher resiliency.

Resiliency emerges when protective factors buffer children against the experience of poverty. As Kerr (2004) notes, it is "possible that we underestimate the ability of parents to somehow protect or shield their young from the worst in terms of economic conditions" (p. 85). The experience of poverty is a highly personal phenomenon, and the smallest of incidences can have an impact on a child's life. Cuthrell, Ledford, and Stapleton (2007) relate the story of a teacher saving empty tissue boxes for a young boy to use to build with at home because he did not have building blocks to play with. Upon relocating to a different school, he asked his teacher to write a letter to his new teacher requesting that she also collect tissue boxes for him. The simplicity of a child's life being enriched by these empty boxes, of the intricate architecture of his imagination being supported by a teacher's smallest gesture, reinforces the influence of supportive relationships in the context of poverty.

How poverty is experienced depends on a number of factors operating in a child's life. Where there are supportive and responsive relationships, or promotive factors to mitigate negative correlates, the effects of poverty are lessened (Luthar & Zelazo, 2003; Sameroff & Fiese, 2000). It is the risks that are associated with poverty that prove to be detrimental for children, and these risks are cumulative in nature. Poverty enacts its influence through a

pathway of variables such as fewer opportunities for learning and cognitive stimulation, unresponsive parenting, and maternal depression (Brooks-Gunn & Duncan, 1997). However, such risks can be associated with families of high socio-economic status (Sameroff et al., 1993). It is the nature of these risks occurring more often in impoverished homes that is of concern to the developmental trajectory of children.

Sameroff et al. (1993) examined the cumulative risks associated with poverty with respect to scores of intelligence in a longitudinal study of a diverse sample of children. Children's intelligence was measured relative to 10 risk factors, including variables such as occupation of head of household, maternal education, and stressful life events. A cumulative risk score was created by dichotomously summing each of the risk factors for the children in the study. Sameroff et al. (1993) demonstrated that the composite risk score explained one third of the variance of intelligence in the sample at 4 years of age and at 13 years of age. The children with the highest scores of cumulative risk performed on average 15 points below their more advantageous peers on measures of intelligence. These findings are similar to research exploring the malleability of intelligence in pairs of identical twins separately raised in low or high socioeconomic environments, with the experience of poverty causing a dampening effect in terms of measures of global cognition (Turkheimer et al., 2003).

In a review of cognitive, emotional, and child health outcomes, Brooks-Gunn and Duncan (1997) demonstrated that poverty status was associated with premature birth, growth stunting, cognitive delay, learning disabilities and externalizing and internalizing behaviours. Children experiencing poverty are more likely to score lower on standardized measures of cognition, resulting in frequent placement in special education classes (Brooks-Gunn & Duncan, 1997). Further, persistent poverty is related to greater effects on cognition than short-term

poverty, and this effect is more pronounced in early childhood than later childhood or adolescence (Brooks-Gunn & Duncan, 1997).

Noble et al. (2005) argue that for young children there are three areas of development, and associated neural bases which underlie this development, that are especially important to school readiness; these brain regions, and their respective functions, are particularly vulnerable to stress such as poverty. Cognitive control, or the capacity to control one's thoughts, actions, and attentional processes, is supported by the prefrontal cortex. Learning and memory, or the capacity to make connections between known and novel information, is linked with the hippocampus. Reading and phonological awareness, comprehending both the phonological and phonemic aspects of language, is supported by temporal, occipital and parietal areas of the left hemisphere.

Research reviewed by Noble et al. (2005) revealed that children from impoverished backgrounds perform less well on tasks involving inhibition, suggesting an impairment in cognitive control. The impact of socio-economic disadvantage, impoverished home environments and low maternal verbal ability collectively influenced children's IQ at age five (Brooks-Gunn, Klebanov, & Duncan, 1996). Kim-Cohen, Moffit, Caspi and Taylor (2004) demonstrated that poverty was associated with lower IQ and anti-social behaviour at age five, with children from stimulating home environments mitigating the influence of socio-economic deprivation. Kim-Cohen et al.'s (2004) finding of enriched home environments acting as a protective factor against the effects of poverty echoes Kerr's (2004) supposition that families are a mechanism of resiliency.

Further, children living in poverty have higher levels of stress hormones, which in turn have a detrimental impact on the hippocampus (Noble et al., 2005). The neural areas associated

with reading ability and phonological awareness seem less affected by the stress of poverty, but are nonetheless moderated by the severity of poverty, with children with low-levels of phonological awareness faring worse than their counterparts of higher socioeconomic status. Socioeconomic status influences children's reading comprehension and decoding skills through phonological awareness from kindergarten to fourth grade, suggesting that poverty effects the literacy and language aptitudes acquired in the early years of life that serve as a foundation for later skill development (Hecht, Burgess, Torgesen, Wagner & Bashotte, 2000). For children living in poverty, damage is not only observable in cognition, health, and emotional development, but represents underlying changes in brain functioning.

Early Intervention for At-Risk Children

The field of early intervention, informed by research and policy, represents services for vulnerable children and their families to support them to achieve their potential, and to lessen the effects of disadvantage (Shonkoff & Miesels, 1990). Guarlnick (2004) suggested that there are two aspects to early intervention programs that are key to a program's success: intensity and specificity. Intensity refers to the duration of a program, as well as the time spent within the program across its duration, while specificity refers to the degree to which the services provided correspond to needs. A program's success depends on its intensity and specificity, with highly intensive programs tailored to the specific needs of children garnering better outcomes.

Child Development Programs: Traditional Approaches to Intervention

Perhaps the most well known early intervention program for preschool children living in poverty is Head Start, which began as an eight week summer program in the 1960s and subsequently extended to 10-months, with Early Head Start emerging in 1995 for children birth to 3 years of age (Zigler & Styfco, 2004). The tenets of the program are to enhance child

development, support child and maternal health, and encourage parental involvement in child development. In Head Start programs, children receive early education, immunizations, healthy meals, and dental and health exams with treatment as required (Zigler & Styfco, 2004). Parents are actively involved in volunteering, and in the governance of centres (Zigler & Styfco, 2004).

Head Start was developed as a holistic school-readiness program, addressing children's educational, health, and nutrition needs within family and community systems (Zigler & Styfco, 2004). Parent involvement is a cornerstone in the Head Start program, with the intent that parents who are actively involved in their children's education and well-being will serve to buffer their children from the effects of poverty through the acquisition of parenting skills (Zigler & Styfco, 2004). Head Start is the precursor to interventions for socially disadvantaged children and its success has been demonstrated in preparing children living in poverty for school and improving family functioning (Zigler & Styfco, 2004). In terms of program intensity and specificity, the Head Start program has a high degree of specificity. Child cognitive, socio-emotional, and physical development is nurtured, and parental involvement is considered a necessary program component. Multiple contexts of development—child, parent, and community—are addressed. However, as a part-time, academic year program, Head Start does not offer a high level of intensity.

Head Start, however, was not envisioned as an educational child care program (Zigler & Styfco, 2004). Head Start is targeted to families experiencing extreme poverty, and spans an academic school year, with children typically attending part-time (Zigler & Styfco, 2004). In contrast, Guarlnick (2004) contends that educational child care may offer the greatest support for impoverished children:

> Enrolment in quality daycare may be the key for these high-risk families, perhaps because of some combination of the universal intensity of the intervention associated with daycare and the highly specific child focus in the intervention-oriented day care programs that may help compensate for other family characteristics and family interaction patterns that are difficult to alter (p. 28).

For children living in poverty, early childhood education and care has the potential to serve as a surrogate to an absent developmentally nurturing environment. The Abecedarian Project represents a comprehensive service delivery model, providing full-day, full-year early childhood education and care for impoverished children (Ramey & Ramey, 2004).

In a review of random control trial studies exploring the effect of the Abecedarian Project on cognitive outcomes, Ramey and Ramey (2004) demonstrated the impact of intensive early childhood education and child care experiences on disadvantaged children. The Abecedarian Project offered children from disadvantaged backgrounds, as evidenced by low maternal education, low maternal IQ, and extremely low family income, with full-day educational experiences provided by trained teachers 5 days per week, 50 weeks per year. A control group received the same benefits of nutrition, health care, and access to medical services as the treatment group, but without the enriched preschool experience. The program met both early intervention criteria of specificity in supporting children's cognitive and school-readiness skills, and intensity in the provision of daily early learning experiences throughout the first five years of life.

In the original study documenting the effects of the Abecedarian Project, and subsequent replications of the program, significant gains in measures of cognition were demonstrated (Ramey & Ramey, 2004). By 18 months of age, children who did not participate in the program

exhibited declines in IQ in comparison to children receiving enriched preschool experiences. Further, the control group averaged 14 IQ points lower than the children enrolled in the Abecedarian Project. In replications of the Abecedarian Project, there was strong evidence that enriched early childhood education and care experiences levelled the achievement gap between at risk children and their more advantageous peers (Ramey & Ramey, 2004).

Several researchers have reviewed and synthesized the effectiveness of early childhood development programs for impoverished children (Anderson et al., 2003; Barnett, 1995; Gorey, 2001; Ramey & Ramey, 2004). Long-term cognitive effects of early childhood development programs have been demonstrated in long-term gains in IQ, less grade retention, and fewer placements in special education classes (Barnett, 1995). Impoverished children had greater gains in IQ than children experiencing less intensive programs, or children not enrolled in early childhood development programs (Gorey, 2001). Further, highly intensive programs were more resistant to fade-out effects than less intensive programs (Gorey, 2001).

Anderson et al. (2003) examined the effectiveness of early childhood development programs with respect to four measures in a systematic review and meta-analysis: cognitive, social, child health screening, and family outcomes. Anderson et al. (2003) applied a rigorous set of standards to the research examining program effects, and synthesized data using a standard effect size. Although the evidence for social, child health screening, and family outcomes was limited because of few studies examining these outcomes, gains in cognition were apparent for disadvantaged children enrolled in early childhood development programs. Effect sizes were as high as 0.89 and 0.81 for academic achievement measures of reading and math, and 2.2 for cognition as measured by IQ. According to conventions established by Cohen (1988) for the interpretation of effect size, an effect size of .8 or greater is considered large. In practical terms,

this translates to a program strongly associated with positive developmental outcomes. Anderson et al. (2003) concluded that a "strong body of evidence shows that early childhood development programs have a positive effect on preventing delay of cognitive development and increasing readiness to learn" (p. 38).

Early Childhood Education and Child Care: A Naturally Occurring Intervention

Quality child care is important for impoverished children and their families in several significant ways: (1) Accessible, affordable child care aids parents, particularly lone-parent families, in work force participation, thereby supporting family income; (2) Quality child care provides stimulating environments, and in so doing, supports school-readiness skills and long-term academic achievement; and, (3) Quality child care leads to improvements in the quality of the home environment (Child Care Advocacy Association of Canada, 2004; McCartney et al., 2007).

In a longitudinal study of child care quality on child outcomes, McCartney et al. (2007) examined the effects of low and high quality child care settings on school readiness and language skills during the first three years of life in a large, diverse sample of children. By comparing low-income children who experienced child care in the first three years of life, with children drawn from the same cohort who did not experience child care, McCartney et al. (2007) explored the hypothesis that child care would act as a protective factor against low income. Observations were gathered from child care settings and were assessed for quality of child-caregiver interactions, caregiver responsiveness and cognitive stimulation. Further, the researchers assessed the child's family home environment through measures of child-parent interactions, responsiveness, and cognitive stimulation.

At 36 months of age, children's cognitive and linguistic competence was evaluated. McCartney et al. (2007) demonstrated that high quality child care was associated with higher scores on measures of expressive and receptive language, and cognitive skills at three years of age, whereas the opposite was true for children not enrolled in high quality child care settings. Lower quality child care was associated with higher measures of receptive and expressive language compared to children who experienced no child care, however, to a lesser degree than children in high quality care settings. For both high and lower quality child care, the positive effects of child care were strongest for the most impoverished children. McCartney et al. (2007) noted that this phenomenon was impressive because the operational definition of high quality was conservative, and may not reflect the highest quality child care available to children. High quality was defined as care that fell at or above the average measure of quality, and this upper half distribution reflected a range of quality experiences, which included care that was only marginally acceptable. McCartney et al. (2007) suggest that children who experience "truly" high quality child care environments would profit more than the children in their study.

McCartney et al. (2007) suggest that quality child care programs act as a "naturally occurring intervention for children from low-income families" (p. 422). Further, this phenomenon is dual in nature: directly, by supporting children's cognitive and language development, and indirectly, by improvements in family environment as a result of children's enrolment in high quality child care programs. At 36 months of age, participation in high quality child care predicted improvements in the home environments of children living in poverty. McCartney et al. (2007) suggested that this may have occurred through informal or formal parenting support offered through child care, and decreased parental stress. However, it is also possible that improvements in family functioning may have arisen at the child level through

increased language competence, or through variables not measured in the current study, such as increased social skills, and behavioural improvement.

The results of the McCartney et al. (2007) study are similar to previous research examining the functioning of child care as a protective factor for children against the negative effects of poverty. Caughy, DiPietro and Strobina (1994) examined the association between early experiences in child care and measures of cognition among five and six-year-old children living in low-income households. Drawing on data from the National Survey of Young Children, Caughy et al. (1994) examined the relationship between low-income, impoverished home environment as defined by level of cognitive stimulation and emotional support offered in the home, early experiences in child care, and cognition in a sample of five and six-year-old children. Caughy et al. (1994) determined that children who experienced child care during the first three years of life had higher scores on measures of mathematical ability and reading recognition at age five and six-years-old than their peers who did not experience child care.

Caughy et al. (1994) subsequently analysed the relationship between child care and measures of cognition by isolating income from the quality of the child's home environment, a similar approach taken by Sameroff et al. (1993) in their examination of the cumulative effects of poverty. Caughy et al. (1994) discovered that regardless of which measure was used, low income or impoverished home environment, the relationship between early childhood education and care and higher scores on measures of reading recognition held true. Further, timing of entry into child care was important for children from impoverished home environments: children who experienced child care at one-year-old performed better on measures of cognition at five and six-years of age than children who were enrolled in child care at two and three years of age.

The study by Caughy et al. (1994) demonstrates the contribution of typical child care experiences, and did not differentiate between child care experiences that were of low or high quality. Overall, the results of the Caughy et al. (1994) and McCartney et al. (2007) studies suggest that child care experiences as they occur naturally positively impact the development of children living in poverty. Within this spectrum of a naturally occurring intervention are child care environments of low or high quality, as measured by the physical environment and activities available to children, and caregiver responsivity. Higher quality programs influence the development of children living in poverty to a greater extent than lower quality programs.

The research conducted by McCartney et al. (2007) and Caughy et al. (1994) revealed that child care provided modest contributions to cognitive and language development when considered overall. This is not to say that child care has only modest influence on child development, rather, child care for impoverished children supported their optimal development, essentially levelling the disparity between children from impoverished backgrounds and their peers (McCartney et al., 2007). In other words, children from impoverished backgrounds experience the greatest benefit from quality child care.

Social Inclusion and Child Care

Quality, universal early childhood education and care offers a naturally occurring early intervention for socioeconomically disadvantaged children through social inclusion (Friendly & Lero, 2002). Social inclusion is based on principles of equal participation in society, an elimination of barriers, and promotion of human development (Friendly & Lero, 2002). Poverty is the experience of social exclusion including systemic public policies driving unfair distribution of resources, inadequate minimum wages, and poor housing, among others (Waldfogel, 2001; Raphael, 2007).

Although child care is not intended to displace programs that are tailored to specific needs of individuals entrenched in systemic poverty, child care does offer both intensity and specificity. Intensity occurs in the form of children's substantial experience in child care programs, specificity in the form of responsive caregiving, and a cognitively and linguistically enriched environment. Social inclusion for children and families offered through the intensity and specificity of high quality child care programs may ease poverty's attendant risks.

Ecology of Early Childhood Education and Child Care

The importance of early childhood education and child care in development, especially for socially disadvantaged children, is not a new idea. Bronfenbrenner (1979), in the ecology of human development, considered early childhood education and child care as a highly influential presence in the lives of young children. To frame early childhood education and care within the context of an ecology of human development necessitates an understanding of the principles of the theory.

Bronfenbrenner (1979) postulated that human development occurs within the context of interrelated environments, each concentrically nested within the next, as illustrated in Figure 2.1. The developing child is influenced by experiences in these interrelated systems, and influences the environment in turn. The microsystem refers to the activities and relationships formed in a child's immediate environment, such as the home. The mesosystem comprises a series of interrelated microsystems, such as the relationship between home and school. The environment in which a child does not actively participate, but nonetheless is influenced by and influences, such as a parent's workplace, is defined by the exosystem. The macrosystem encompasses the culture, subcultures, values, and belief systems of the society in which a child develops.

Development occurs within the context of substantive activities, relationships, and roles the child experiences across systems.

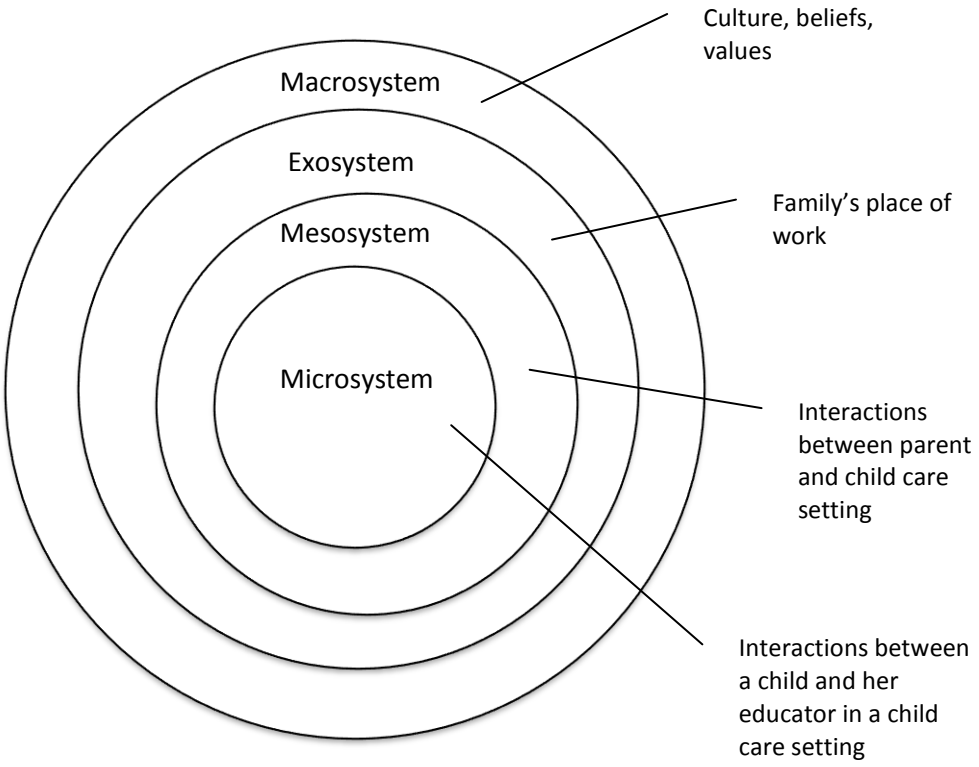

Figure 2.1. The ecology of child care, based on Bronfenbrenner (1979)'s ecological theory of human development

Applying Bronfenbrenner's (1979) ecological theory of development to the research conducted by McCartney et al. (2007) and Caughy et al. (1994), the impact of child care on development can be demonstrated. To illustrate, consider a three-year old child living in poverty who has experienced quality child care since infancy. McCartney et al. (2007) determined that environments rich in caregiver responsiveness and cognitive stimulation led to positive developmental outcomes for impoverished children. A three-year old child in a quality child care environment would experience the substantive activities necessary for optimal development.

Bronfenbrenner (1979) defines such activities as molar activities, "an ongoing behaviour possessing a momentum of its own and perceived as having meaning or intent by the participants in the setting" (p.45). In the microsystem of a child care setting, development is facilitated by the relationship of the child and early childhood educator; if the relationship is attentive, responsive, and scaffolding, developmental gains are made by the child (Bronfenbrenner, 1979).

Development is demonstrated when a child carries out substantive activities across settings (Bronfenbrenner, 1979). A three-year old from an impoverished home environment may not have access to a mutually responsive parent-child relationship, however, as this child returns to the microsystem of the home, the child brings what is acquired from the microsystem of the child care setting. The interconnected microsystems of home and child care setting form a mesosystem in which the child develops. The developing child brings positive behavioural adaptations, and novel ways of interacting with and perceiving the environment from child care setting to the home, and instigates development of the parent. As Bronfenbrenner (1979) contends, when "one member of a dyad undergoes developmental change, the other is also likely to do so" (p. 65). Further, as the parent engages in the child care setting, the influence of the early childhood educator's caregiving insights, or informal parenting advice, may alter the parent-child relationship, home environment, and further support positive development (McCartney et al., 2007).

Even though a three-year old child may never enter a parent's workplace, Bronfenbrenner's (1979) ecological theory suggests the child will nonetheless influence, and be influenced by, this exosystem. Applying Bronfenbrenner's (1979) ecological theory to McCartney et al.'s (2007) research, an assumption may be made that high quality, reliable child care assists income stability while supporting child development. Multiple systems levels are

affected by the experience of quality child care. In the macrosystem of public policies which favour affordable, accessible, high quality child care, parents are enabled to secure child care that encourages positive child development in settings where the professionalism of early childhood educators is valued.

However, just as high quality child care leads to positive child development (McCartney et al., 2007; Caughy et al., 2004), the ecololgical theory of child development assumes that low quality child care is detrimental to developmental outcomes. The primacy of responsive child-adult interactions is a cornerstone of a developing child's microsystem. As Bronfenbrenner (1979) states:

> Learning and development are facilitated by the participation of the developing person in progressively more complex patterns of reciprocal activity with someone with whom that person has developed a strong and enduring emotional attachment and when the balance of power shifts in favour of the developing person. (p. 60)

Positive development is contingent upon the interpersonal structures that a child forms with a responsive caregiver (Bronfenbrenner, 1979). When the relationship between a child and a caregiver, whether a parent or early childhood educator, is maladaptive, poor developmental outcomes may emerge (Bronfenbrenner, 1979). High quality child care and low quality child care are aspects of an impoverished child's potential to experience resiliency: high quality child care may serve as a surrogate for an impoverished home environment, and influence parent development, whereas low quality child care may serve to hamper development at multiple systems levels.

The macrosystem permeates the layers of exosystem, mesosystem, and microsystem. The macrosystem captures the beliefs and values of society, reflected in the public policies that

drive program development (Bronfenbrenner, 1979). The experience of poverty is a macrosystem in itself (Bronfenbrenner, 1979), a subsystem within the structure of Canadian society, accompanied by prejudices and beliefs (Raphael, 2007). Bronfenbrenner (1979) argues that child development research should be aligned with public policy in a "two way interaction" (p. 231), such that public policy guides and is shaped by developmental research.

The Macrosystem of Early Childhood Education and Care Policy in Canada

Early childhood education and care in Canada is historically separated in policy and practice, with the delivery of early learning programs considered a public responsibility, and child care a private choice (OECD, 2006). While kindergarten is recognized as an integral component of education across jurisdictions, child care is separated from the education system, except for Saskatchewan and Ontario, where child care is solely are under the auspice of ministries of education (Beach et al, 2008; HRSDC, 2012). This alignment with the education system translates to a common pedagogical focus between child care and education (OECD, 2006). As with education, child care is a provincial and territorial responsibility (Beach et al, 2008). In Canada, there is an absence of a national child care program (Beach et al., 2008), translating in a "patchwork" of service-delivery models of mixed public and private enterprise (Canada Child Care Advocacy Association, 2004).

Except for Quebec, where there is a universal system of publicly funded childcare, where parents, regardless of income pay a small parent portion, public spending on child care is largely limited to operational grants and subsidies for low-income families (Beach et al., 2008). The income-tested method of funding child care is embedded in the history of child care in Canada as a social service. In the 1960s, as part of an effort to alleviate poverty, mirroring the political climate of the United State's "war on poverty" (Zigler & Styfco, 2004), the Canada Assistance

Plan (CAP) framed child care as a welfare service, and stipulated that funding would be directed to low-income families (Beach et al., 2008; Ismael, 2006). Since then, through feminist discourse, and the growing utilization of child care by middle-class families, the ideological notion of child care as primarily a welfare service gradually changed, but the remnants of child care as a social service separate from the public education system remain (Beach, 2008).

As the ebb and flow of political directions shifted, and CAP was cancelled in 1996 to be replaced by the Canada Health and Social Transfer (CHST), several national child care programs were considered without materializing, until the 2004 Multilateral Framework on Early Learning and Child Care advanced by the Liberal Party (Beach et al., 2008). The Multilateral Framework on Early Learning and Child Care was an agreement between federal and provincial governments to develop a national child care program based on four principles of quality, universality, accessibility, and developmental programming (Beach, 2008). These federal-provincial agreements were subsequently cancelled when the federal conservatives were elected in 2006, with the Multilateral Framework on Early Learning and Child Care being replaced by the Universal Child Care Benefit, a taxable child care benefit, and the Spaces Initiative, funding for which was significantly less than Multilateral Framework on Early Learning and Child Care (Beach et al., 2008).

The current political position concerning child care is typified in Canada's position as a liberal welfare state (Raphael, 2007). Liberal welfare states favour marketplace distribution of goods and low spending on social programs (Raphael, 2007), and early childhood education is a part of this policy in the rhetoric of "school-readiness" that prepares children to be successful in school and economically viable citizens (OECD, 2006). The Organisation for Economic Co-

operation and Development (2006) describes the developmental importance of child care in the scope of liberal economies:

> [E]vidence from brain research has helped to direct "child care" services to a more developmental approach. The early nurturance of infants and toddlers is seen to be of major importance because of the extraordinary neurological development that occurs in this period. Faced by this evidence, it is more difficult for governments to consider large-scale, extra-domestic child care for children under kindergarten age as having little importance for a country's human capital policies. (p. 39)

Aside from the unfolding of full human developmental potential, child care assists labour market participation of families, and lays the foundation for future economic growth.

Summary

Child care and education in Canada are historically separated (Beach et al., 2008), and embedded within the macrosystem of a liberal welfare ideology. Child care support for Canadian families is means-tested, and directed to low-income families in the form of subsidies (Beach et al., 2008; Ismael, 2006). In light of poverty's developmental consequences, and a rising poverty rate (OECD, 2008), a growing proportion of families and children may benefit from the benefits of quality child care (OECD, 2006; Raphael, 2007). The efficacy of targeted programs for impoverished children has been demonstrated (Anderson et al., 2003; Barnett, 1995; Gorey, 2001; Ramey & Ramey, 2004; Zigler & Styfco, 2004), however, less is known concerning the effect of typical child care programs on supporting the development of children experiencing poverty. With a growing population of poor, and increasing social stratification (OECD, 2008), insight into the magnitude of the effect of child care as a means of ameliorating poverty may reveal programs and practices that are of the greatest benefit.

Purpose of the Present Study and Research Questions

The present research will use the premise of child care as a naturally occurring intervention for young children as a point of departure (McCartney et al., 2007). A systematic review and meta-analytic framework will explore the following questions:

1. What is the current state of research in the study of child care as a means of supporting developmental outcomes for children experiencing poverty?
2. Is there an effect of child care on developmental outcomes for impoverished children?
3. What is the magnitude of the effect of child care on developmental outcomes for impoverished children?
4. What are the characteristics of child care programs that support children experiencing poverty?

The present study is significant because previous reviews and meta-analyses have considered child care within the scope of formal early intervention programs that are designed for impoverished children. The unique contribution of child care is less known in meta-analyses of research. The first question frames the subsequent questions, providing context for the functioning of child care as a naturally early intervention. Answers to the remaining questions will shed insight into the strength of relationship between child care and child outcomes, and how early childhood education and child care operates as a naturally occurring intervention.

CHAPTER THREE: METHODOLOGY

This chapter describes the methodology used in the investigation of child care as a naturally occurring intervention for impoverished children. The research approach, rationale, and research protocol are detailed in this chapter. In addition, the approach to data synthesis, related statistical formulae, and computational procedures are described.

Research Approach: Systematic Review

Systematic reviews describe, synthesize, and interpret data extracted from primary research sources (EPPI Centre, 2010; Gough, Oliver, & Thomas, 2012; Penn et al., 2004; Penn & Lloyd, 2006). The methodological purpose is to answer a research question, and to synthesize data into a statistically or narratively meaningful way. Systematic review is a relatively new approach to investigating questions in social science and education research, with the history of this technique first emerging in the health sciences (Penn & Lloyd, 2006). Systematic reviews go beyond traditional narrative research reviews by making explicit the process of the review, opening the methodology to scrutiny and replicability, identifying research parameters, and taking into account the methodological merits and limitations of primary research studies (EPPI Centre, 2010; Gough et al., 2012; Penn et al., 2004; Penn & Lloyd, 2006).

Research Protocol

In systematic reviews, the research protocol details the methods applied to carry out the review (EPPI Centre, 2010; Gough et al., 2012; Penn et al., 2004; Penn & Lloyd, 2006). The research protocol for the present study involved identifying: (1) inclusion and exclusion criteria, (2) search terms, (3) coding protocol and study level descriptors, and (4) data synthesis procedures.

Inclusion and Exclusion Criteria. The inclusion and exclusion criteria is a precise delineation of the research included in the synthesis to answer the research questions (Anderson

et al., 2003; EPPI Centre, 2010; Gough et al., 2012; Penn et al., 2004; Penn & Lloyd, 2006). The research questions for the present study guided the development of inclusion and exclusion criteria (EPPI Centre, 2010; Gough et al., 2012; Penn et al., 2004; Penn & Lloyd, 2006).

Primary, evaluative research examining the impact of centre-based child care on children six years old and under who experience poverty, published in English from 1994 to present was included in this study. This time frame was selected in accordance with Caughy et al.'s (1994) observation that the effect of child care on child outcomes had not been examined in-depth prior to 1994. Further, this initial time limit parallels the first international review of early childhood education and care undertaken by the OECD, which brought early childhood education and care policy to the forefront of public and political consciousness (OECD, 2001).

Exclusion criteria applied to primary research examining outcomes for children in early childhood intervention programs, which are well documented in literature (e.g., Anderson et al., 2003; Barnett, 1995; Gorey, 2001; Ramey & Ramey, 2004). Of interest in the present study was the unique contribution of child care programs for children experiencing poverty. In addition, to limit the scope of the present study, inclusion criteria applied to research that was peer-reviewed and quantitatively reported.

Although systematic reviews typically include searches of grey literature (Gough et al. 2012; Lipsey & Wilson, 2001), the present review included published research alone. An inherent assumption of solely including published research is the bias for published research to be statistically significant, and the research question to be informed by studies that reflect only a portion of all research (Lipsey & Wilson, 2001). This assumption was acknowledged, however, restricting the present study to published research did not discount the review as unsystematic

(EPPI Centre, 2009). Reviews of published research alone are systematic when the procedures for carrying out the review are transparent and open to replicability (EPPI Centre, 2009).

Inclusion and exclusion criteria were itemized from one to nine, and described the central parameters under which individual studies were included or excluded (see Appendix A). The inclusion and exclusion criteria were applied to the titles and abstracts identified from the search terms. Literature reviews were examined for potential inclusion of primary research, and references of primary studies meeting inclusion criteria were reviewed for relevant research.

The application of inclusion and exclusion criteria lead to a broad characterization of the published literature base (Penn et al., 2004; Penn & Lloyd, 2006), and served as a foundation for the literature map of the state of research examining the impact of child care on outcomes for children experiencing poverty. Each inclusionary/exclusionary criterion described under what circumstances research was included or excluded from the literature map. Further, where there was ambiguity concerning whether a study should be included or excluded, the full document was retrieved and reviewed.

Search Terms. Previous reviews describing the application of systematic review methodology in early years research demonstrated the weakness of indexing in bibliographic databases (Penn et al., 2004; Penn & Lloyd, 2006). Early years research is subject to a substantial degree of interpretation and inconsistency by indexers (Penn et al., 2004; Penn & Lloyd, 2006). For example, Penn and Lloyd (2006) noted searches for studies indexed as *nursery* may lead to the identification of studies examining "plants and baby fish and miss studies that are actually focused on nursery care" (p. 327). In the present study, search terms were sensitive to identify as many published sources as possible to mitigate this weakness (Penn

et al., 2004; Penn & Lloyd, 2006). Search terms broadly included terms related to child care and socioeconomic status (see Appendix B).

Terms related to child care (e.g. preschool, daycare, playschool) were adapted from Penn et al. (2004), while terms related to socioeconomic status (e.g. poor, low-income, disadvantaged) were derived from language commonly related to poverty. Child care search terms were combined, and separated by the Boolean operator *or*. This process was likewise carried out for socioeconomic search terms, yielding two data sets comprising all search terms for child care and socioeconomic status. The final step involved combining the child care and socioeconomic search terms with the Boolean operator *and*.

A selection of databases searched in previous systematic reviews (e.g. Anderson et al., 2003; Penn et al., 2004) examining the effects of early childhood education and care was searched for the present review, including PsychINFO, Education Resource Information Centre (ERIC), Sociological Abstracts and Social Services Abstracts. Citations generated from the search terms were managed in RefWorks.

Coding Protocol and Study Level Descriptors. The coding protocol captured the study level descriptors, including the methodological and substantive features of primary research. (Gough et al., 2012; Lipsey & Wilson, 2001). Primary research meeting inclusion criteria was coded in detail to extract information concerning the influence of methodological factors on study results. A coding protocol articulating study level descriptors was applied to individual studies meeting all criteria for inclusion (see Appendix C). Study level descriptors outlined in the coding protocol are described in greater detail below.

Methodological Descriptors. An overarching intent of systematic reviews is to include research of high quality to inform the review's research questions (EPPI Centre, 2009; Penn et

al., 2004). However, detailed methodological descriptions are often absent in primary research, and further, research is often poorly designed and executed (Lipsey & Wilson, 2001; Penn et al., 2004).

The present study appraised research according to a weight of evidence approach informed by the EPPI Centre (EPPI Centre, 2010; Gough et al., 2012; Penn et al., 2004; Penn & Lloyd, 2006). This approach considered the generic quality and relevance of research in answering review questions (EPPI Centre, 2010; Gough et al, 2012; Penn et al., 2004; Penn & Lloyd, 2006). The weight of evidence approach applied in the present study appraised: (1) the soundness of the research, (2) the appropriateness of the study design and analysis in answering review questions, and (3) the match between the intent of the research and the questions of the present study (EPPI Centre, 2010; Gough et al, 2012; Penn et al., 2004; Penn & Lloyd, 2006).

The first consideration was specific to the quality of the research itself, the latter two were specific to the relevance of the research in addressing the purpose of the present study (Gough et al., 2012). Assessing the soundness of the research involved appraising the study design and the degree to which confounding factors were controlled (Penn et al., 2004). Further, intrinsic to this generic assessment of study quality was the reporting quality of the study, such as whether information was reported with clarity so as to understand the recruitment and composition of the sample, the instruments used, and the researchers' intent (Penn et al, 2004). As a result, a low appraisal of generic quality may have been a result of the study itself, or the poor reporting quality of the research (Penn et al., 2004).

This weight of evidence approach assigned an overall appraisal rating of low, medium, or high (Gough et al., 2012; Penn et al., 2004; Penn & Lloyd, 2006). Adapting the overall rating scheme of Penn et al. (2004), to receive a high appraisal rating, included research in the present

study was required to achieve a high rating for all three areas of consideration while a low rating was assigned to studies appraised as low in two or three areas of consideration. Further, studies were assigned a medium appraisal rating for all other scenarios.

Substantive Descriptors. Substantive descriptors identified the nature of child care programs, and author findings. Capturing substantive descriptors separate from methodological characteristics avoided confounding the effect of child care with methodological artefacts (Lipsey & Wilson, 2001). This approach disentangled research findings from the methodological features of the study, such as the particular child care (e.g. amount, quality), poverty (e.g. below the poverty threshold, lowest income segment of the sample), or outcome (e.g. cognitive, behavioural) measure used. Further, substantive descriptors identified features of child care programs producing the largest effect (Lipsey & Wilson, 2001).

Data Extraction and Synthesis. The study level protocol served to guide data extraction from the primary research included in the present study. Data extracted through the coding protocol was brought together in a narrative empirical synthesis through tabulation and structured narrative of primary research results (EPPI Centre, 2010). Effect size calculation and statistical meta-analysis complemented narrative synthesis where appropriate. Although data extracted from primary studies was applicable to narrative synthesis, synthesis through meta-analysis was constrained by the level of data reported. For example, data reported in the form of correlations, means, standard deviations, or *t* statistics was necessary for meta-analysis to proceed (Lipsey & Wilson, 2001).

Meta-Analysis. The synthesis of data in a meta-analysis is applicable to quantitative data alone (Cooper, 2010). Meta-analysis is the translation of statistical data in a single study to a metric reflecting the strength of a phenomenon in a sample (Lipsey & Wilson, 2001). This

metric is referred to as the effect size, and is an expression of the degree of variability between two population means (Cohen, 1988). The greater the variability between means, the stronger the presence of the phenomenon in the underlying population (Cohen, 1988).

Cohen (1988) situated the effect size within the scope of statistical power analysis. The power of a statistical test is the ability to detect a difference between populations when one exists, and the effect size is a measure of the magnitude of the difference (Cohen, 1988). As Cohen (1988) indicated:

> [W]hen the null hypothesis is false, it is false to some specific degree, i.e., the effect size (ES) is some specific nonzero value in the population. The larger this value, the greater the degree to which the phenomenon under study is manifested. (p.10)

The effect size is necessary to understanding the practical meaning of what is being studied (Tabachnick & Fidell, 2006).

The foundation for meta-analysis is individual effect sizes (Lipsey & Wilson, 2001). In essence, meta-analysis is the average of individual effect sizes, each capturing "one empirical relationship involving the variable(s) of interest" (Lipsey & Wilson, 2001, p. 35). A single primary research study can include more than one effect size, as in the case of a research study examining the effect of child care on two different outcome variables. However, effect size statistics drawn from the same sample cannot be aggregated because they are statistically dependent (Lipsey & Wilson, 2001). In aggregation, a single effect size from a study sample must be determined, whether an average of study-level effect sizes is selected, or a single effect size representing a construct is selected and the others discarded (Lipsey & Wilson, 2001).

Calculating Effect Size. The effect of child care on child outcomes was of interest for the present study. Effect sizes were calculated according to the nature of the primary research statistic, and the detail of the information provided by the researcher (Lipsey & Wilson, 2001).

Standardized Mean Difference. The standardized mean difference is a scale free measure of variability, expressed as the difference between means divided by the pooled standard deviation (Cohen, 1988; Cooper, 2010; Lipsey & Wilson, 2001):

$$ES_{sm} = \frac{\bar{X}_{G1} - \bar{X}_{G2}}{sp}$$

Where ES_{sm} is the effect size, or standardized mean difference, $\bar{X}_{G1}$ is the mean of Group 1, $\bar{X}_{G2}$ is the mean of Group 2, and sp is the pooled standard deviation. Implicit in this measure is the comparison of contrasting group means measured on a continuous scale. Further, because the measure is scale free, ES_{sm} allows for the comparison of multiple outcome measures capturing the same construct (Lipsey & Wilson, 2001).

Interpreting the Standardized Mean Difference. ES_{sm} may be interpreted as the degree to which means differ expressed as standard deviation units. As an illustration, consider a primary research study examining the effects of child care on verbal reasoning for a group of impoverished children. One group ($\bar{X}_{G1}$) experiences quality child care, while the second group ($\bar{X}_{G2}$) does not experience child care. The ES_{sm} calculated from the standardized difference between group means represents how many standard deviations the groups differ from each other on the measure of verbal reasoning (Cooper, 2010). If the ES_{sm} is 0, there is no difference between means, whereas if ES_{sm}=0.85, the means differ by 85 one-hundredths of a standard deviation (Cooper, 2010). Figure 3.1 illustrates an example of the population distributions of two hypothetical groups, one experiencing child care as a naturally occurring intervention, and

the other not experiencing child care, adapted from Cooper (2010). The greater the magnitude of $ES_{sm,}$ the greater the groups differ on the outcome measure, and the more effective the intervention.

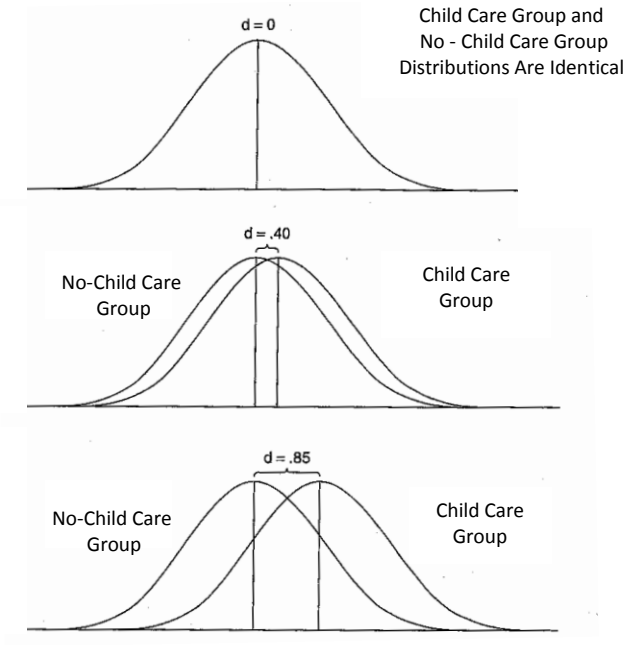

Figure 3.1. Effect size distributions as a function of ES magnitude in a hypothetical examination of the effects of child care on child outcomes, adapted from Cooper (2010).

Cohen (1988) established guidelines for the interpretation of the magnitude of ES_{sm}, defined according to small, medium, or large effect size. Small ES are operationalized as .2, medium effect sizes as .5, and large effect sizes as .8. The present research operationalized ES_{sm} according to the same convention. Cohen (1988) provided insight into the relative interpretation of ES:

> An effort was made in selecting these operational criteria to use levels of ES which accord with a subjective average of effect sizes such as are encountered in behavioural science. "Small" effect sizes must not be so small that seeking them amidst the inevitable

> operation of measurement and experimental bias and lack of fidelity is a bootless task, yet not so large as to make them fairly perceptible to the naked observational eye. (p 13)

Although ES is interpreted quantitatively, the assignment of a small, medium, or large effect size requires qualitative insight into the nature of the intervention, the characteristics of programs producing successful outcomes, and an examination of methodological characteristics. In alignment with Cohen's (1988) operational definition of ES, a small effect size of .2 in the present study was interpreted as practically meaningful.

Weighing Effect Sizes. Calculating the mean ES_{sm} involves weighing each effect size statistic by its respective inverse variance (Lipsey & Wilson, 2001). Weighing ES by the inverse variance ensures that ES based on small sample sizes are not given disproportionately greater weight in meta-analysis than ES based on larger sample sizes. In the absence of weighing ES_{sm} by the inverse variance, ES based on smaller samples are interpreted comparable to ES based on larger sample sizes, and contribute equally to the ES mean.

Calculation of the adjusted ES involves multiplying the inverse variance by the uncorrected ES. For ES_{sm}, the inverse variance is calculated as follows (Lipsey & Wilson, 2001):

$$ES'_{sm} = \left[1 - \frac{3}{4N - 9}\right] ES_{sm}$$

$$SE_{sm} = \sqrt{\frac{n_{G1} + n_{G2}}{n_{G1} n_{G2}} + \frac{(ES'_{sm})^2}{2(n_{G1} + n_{G2})}}$$

$$w_{sm} = \frac{1}{SE^2{}_{sm}} = \frac{2 n_{G1} n_{G2} (n_{G1} + n_{G2})}{2(n_{G1} + n_{G2}) + n_{G1} n_{G2} (ES'_{sm})^2}$$

Where ES_{sm} is the standardized mean difference, N is the total sample size ($n_{G1} + n_{G2}$), n_{G1} is the number of subjects in Group 1, and n_{G2} is the number of subjects in Group 2 (Lipsey & Wilson, 2001).

Calculating the Effect Size Mean. The effect size mean is determined by summing each ES by its inverse variance weight, divided by the sum of the weights (Lipsey & Wilson, 2001):

$$\overline{ES} = \frac{\sum(wiESi)}{\sum wi}$$

Where ESi is the individual ES statistic, and wi is the inverse variance weight.

In determining whether it is appropriate to calculate $\overline{ES}$, a test of the homogeneity of variance must be completed. Homogeneity analysis demonstrates whether the individual ES statistics to be averaged are drawn from the same ES distribution (Lipsey & Wilson, 2001). If the individual ES statistics vary by sampling error alone, the criteria of homogeneity of variance is met, and calculation of $\overline{ES}$ can proceed. Alternatively, if it is determined that the individual effect sizes are heterogeneous this indicates that the individual effect sizes are not drawn from the same distribution, and differ according to systematic or random variance.

Homogeneity analysis is carried out through calculation of the Q-statistic (Lipsey & Wilson, 2001):

$$Q = \sum wi\ (ESi - \overline{ES})^2$$

Where ESi is the individual ES through to k number of effect sizes, $\overline{ES}$ is the weighted mean effect size, and wi is the individual inverse variance for each respective ES (Lipsey & Wilson, 2001). If the Q-statistic is found to be statistically significant as determined by the associated critical chi-square value with k-1 degrees of freedom, the ES variances are deemed to be heterogeneous.

In the present study, the calculation of $\overline{ES}$ was iterative. If it was determined that the test of homogeneity of variance was not met, analysis of $\overline{ES}$ did not proceed and individual effect sizes were examined. On the other hand, if the Q-statistic was found to not be statistically significant, $\overline{ES}$ was calculated, in addition to the analysis of individual effect sizes.

Computation of Effect Sizes and the Effect Size Mean. Raw data in the form of group means and standard deviations supported calculation of ES_{sm} in the present study. However, a brevity of data reported in primary research often precluded direct effect size calculation (Lipsey & Wilson, 2001). Where statistics (e.g. bivariate correlations, *t* –tests) were reported that were compatible to ES_{sm} calculation, algebraically equivalent calculation of ES_{sm} was possible (Lipsey & Wilson, 2001). In the case of studies not reporting sufficient data for the purposes of calculating an estimation of ES_{sm}, calculation of $\overline{ES}$ (i.e. meta-analysis) for those studies did not proceed (Lipsey & Wilson, 2001).

Computation of individual effect sizes and the mean effect size was undertaken in Comprehensive Meta-Analysis (CMA) Version 2.0.

Summary

This chapter detailed the systematic and data synthesis approach for examining the effect of child care on child outcomes for children experiencing poverty. A description of the inclusion and exclusion criteria, search terms, research protocol and study level descriptors, and the approach to data synthesis was described. The following chapter provides the results yielded through application of the methodology.

CHAPTER FOUR: RESULTS

This chapter presents the results of the systematic and meta-analytic inquiry of the impact of child care on developmental outcomes for children experiencing poverty in alignment with the research questions posed. The first section describes the current state of research, while the second section provides the results of the in-depth review to shed insight into the effect of child care on child outcomes. The magnitude of this effect is presented in the subsequent section through calculation of effect sizes, and combined in a meta-analytic inquiry as a single effect size. Lastly, characteristics of child care programs supporting positive child development are presented.

Current State of Research

Application of Inclusion/Exclusion Criteria and Systematic Mapping

In exploring the state of research pertaining to child care as a means of supporting child outcomes for children experiencing poverty, a wide range of search terms were identified which resulted in a high degree of sensitivity, resulting in a wide net cast over the literature base, and the exclusion of a large number of studies. Figure 4.1 presents the results in the form of a systematic map according to the inclusion/exclusion criteria.

Characteristics of Excluded Studies. The majority of citations reviewed were excluded according to criterion one as a result of not focusing on the impact of centre-based child care on child outcomes specifically. Examples of themes emerging from studies excluded under criterion one include: policy papers, child care data indicators without context, selection of child care arrangements, child care costs, access and utilization, status of the early childhood education and care workforce, quality child care in the absence of child outcomes, parenting practices,

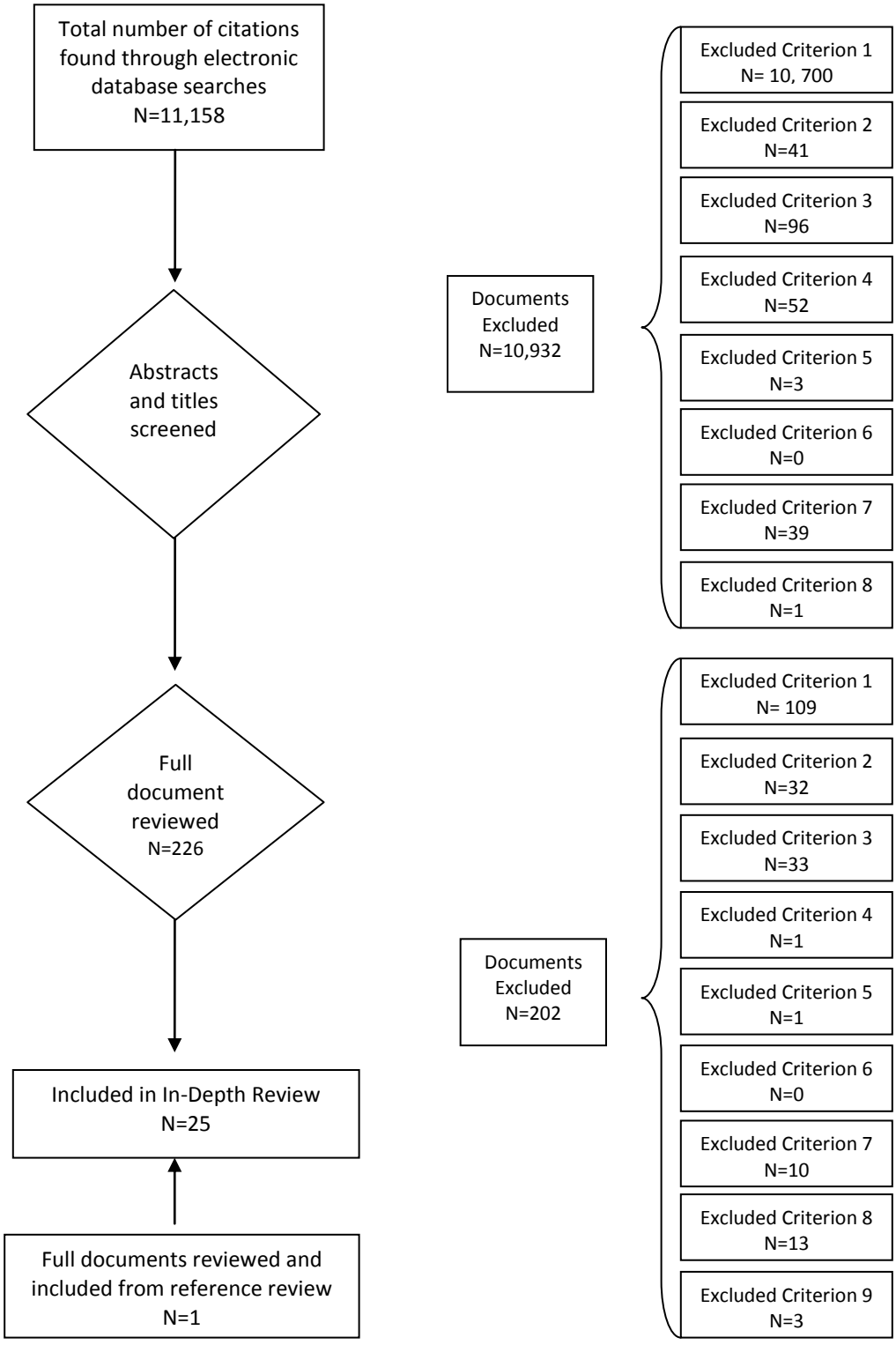

Figure 4.1. Systematic Map of the Literature Base Examining the Impact of Child Care on Child Outcomes for Children Experiencing Poverty

parental attachment and maternal depression. Exclusion criteria two and three were the second most frequent categories of exclusion, although they represented a small fraction of the total number of citations identified. Studies excluded under criterion two examined the effect of child care on child outcomes without focusing on children experiencing poverty as a central intent of the research. Studies excluded under criterion three included a child care component, but were interventions contrived to support children experiencing poverty.

Many studies were identified (N=226) that were subsequently retrieved and reviewed because they were either potential papers to include in the in-depth review, or because the abstract alone was not sufficient to determine the categorization of the study. The latter often emerged through the interpretation of the terms preschool or child care, which may have variously meant child care, public prekindergarten, or early intervention, depending on the context of the study and the authors' perspective on the meaning of the terms. One study was identified from reviewing references of literature reviews (Magnuson et al., 2004). Review of full documents lead to the inclusion of 25 studies for the in-depth review.

Effects of Child Care on Outcomes for Children Experiencing Poverty: In-Depth Review

Table 4.1 provides summary details for studies according to the intent of the study, intervention, measures, approach to analysis and findings. Also included in the table is the "weight of evidence" for each study representing a summation of the generic quality of the study, and the relevance of the study when considered against the review questions.

Table 4.1. In-Depth Review of Included Studies

ID and Study Type	Intent	Intervention and Measures	Data Analysis and Findings	Weight of Evidence A -Soundness (Generic) B - Appropriateness of the study design and analysis in answering review questions (Relevance) C- Match between the intent of the research and the questions of the present study (Relevance)	Effect Size (Standardized Mean Difference or Correlational) Data
Ansari et al. (2012) Non-experimental, prospective study	To compare low-income children on developmental outcomes based on attendance in centre-based or home-based care.	N=6929 Intervention: A range of child care centres (e.g. for profit, not-for profit, licensed and licensed exempt) and family child care homes. Poverty measure: Subsidy receipt. Child Care Measure: *Type*: Centre based child care or family child care homes. Child Outcome Measures: *Cognitive, verbal, and fine motor skills:* Learning Accomplishment Profile – Diagnostic. *Social skills and behavioural problems*: Deveruex Early Childhood Assessment (parent and teacher completed).	ANOVAs for each outcome of interest Children in centre based care exhibited more growth overtime in cognitive, language, and fine motor skills (Fall – T1 measure, Spring – T2 measure), compared to those in family child care, although family child care had an initial advantage. Behavioural outcomes did not vary according to centre or home based care.	Overall: Medium *A: Medium:* Limited demographic information was available for the entire sample (i.e. centre-based and home-based samples were assumed to be equivalent, based on a portion of the complete sample). Reliability of outcome measures was reported. *B: Medium:* Head Start was not included in analyses, allowing for a separation of child care from formal intervention programs. Causality could not be inferred. *C: Medium:* The comparison of children in different care types was the focus of the study, rather than a specific focus on children in centre-based care.	Group means, standard deviations, sample sizes.
Bassock et al. (2008) United States	To determine whether the experience of centre based	N=229 Intervention: Child care centres of a "garden variety"	Ordinary Least Squares regression Child care participation at	Overall: Low *A: Low:* The relationship between children experiencing poverty and	Data was not provided in a format to allow for

Non-experimental, prospective study	child care within the first five-years was associated with cognitive and social advantages in low-income children at age 7.5, after controlling for a range of maternal, home, and child-level factors.	supported by public funds (both centers and homes are included as child care experiences). Child Care Measures: *Centre participation*: Enrolment in child care for at least 10 hrs/week at wave one (~2.5 years of age) and wave two (~4.5 years of age). *Quality*: Early Childhood Environment Rating Scale (ECERS);educational attainment of caregiver/teacher. Poverty measure: The sample was recruited through a welfare-to-work program. Child outcome measures: Wave One: *Cognitive and language development*: MacArthur Communicative Development Inventory. Wave Two: *Cognitive and language development:* Bracken Basic Concept Battery Wave Three: *Cognition:* Wechsler intelligence scale for children. *Behaviour:* Child Behaviour Checklist and Teacher's Report Form.	wave one and/or wave two did not significantly predict cognitive and language proficiencies at wave two; when gender was removed as a covariate, child care attendance became significant; the same was true for cognitive measures at 7.5 years of age (n.s. until gender was removed). Child care participation was unrelated to behaviour problems. Child care quality was unrelated to cognitive outcomes at 7.5 years of age.	child care participation was not definitive due to gender acting as a proxy for centre attendance (demographic information indicated girls were more likely to participate in centre based care). Child care quality was measured at only one point in time, which the authors suggested may have led to the lack of a significant finding between quality and child outcomes. Reliability of measures was not specifically reported. *B: Low:* Based on the authors' definition of child care, there was a strong potential for Head Start to be conflated with child care. Causality could not be inferred. *C: Low:* The intent of this study appeared to be less about *naturally occurring* child care experiences, and more about nebulous early learning experiences.	effect size calculation.

Burchinal et al. (1996) Non-experimental, prospective study	To determine the association between quality of centre based care on developmental outcomes of children from low-income families.	Sample N=79. African American infants from predominately low-income families who were recruited as part of a larger, prospective longitudinal study examining otitis media hearing loss on developmental outcomes. Intervention: Full-time, community based child care centres. Child care measures: *Age of entry into child care:* Age at which children entered centre-based child care. *Quality*: Global quality evaluated through the Infant-Toddler Environment Rating Scale (ITERS); structural quality measured through infant/adult ratio, infant class size, educator training and experience. Poverty measure: <185% of federal poverty guidelines. Child outcome measures: *Cognitive development:* Bayley Scales of Infant Development. *Language development*: Sequenced Inventory of Communication Development-Revised Communication and Symbolic	Hierarchical Linear Models Children overall experienced poor quality child care, however, quality child care predicted positive child outcomes. Higher quality global infant care was significantly associated with better cognitive outcomes; higher structural quality (infant/adult ratios) was significantly associated with better communication outcomes. Later entry into child care was associated with greater expressive language outcomes.	Overall: Medium *A: Medium:* Potential covariates were entered into the analysis. Reliability of most measures was reported. The sample was based on convenience. *B: Medium:* Causality could not be inferred. *C: Medium:* Community, centre based child care was the focus of the study, as demonstrated by the authors' detailed description of the licensure and accreditation status of centres. A range of quality measures was examined, in addition to the effect of child care on infants, which as the authors indicated, is an understudied phenomenon. As a study whose intent was to examine the influence between child care and outcomes, the effect of child care in terms of *impact* was limited.	Bivariate correlations.

		Behaviour Scales.			
Burchinal et al. (2006) United States Non-experimental, prospective study	To determine the relationship between risk and children's outcomes during the first 4 years of elementary school, and the extent to which child care, family, and school factors serve as protective factors in the context of risk.	Sample N=75. Predominately low-income, African American children who participated as infants in a larger, prospective longitudinal study examining otitis media hearing loss on developmental outcomes, and followed until early elementary school. Intervention: Child care programs; full-time child care in infancy, and a range of programs prior to kindergarten enrolment (e.g. Head Start). Child Care Measures: *Quality*: Global quality evaluated through the Infant-Toddler Environment Rating Scale (ITERS) or Early Childhood Environment Rating Scale (ECERS). Poverty Measure: <185% of federal poverty guidelines. Child Outcome Measures: *Academic outcomes*: Woodcock Johnson Tests of Achievement – Revised. *Social Skills*: Social Skills Rating System, Grades K-6	Hierarchical Linear Model Child care was framed as a protective factor, interacting with risk to influence child outcomes. For children experiencing social risk (including poverty), higher quality child care protected children from the development of behaviour problems and poor mathematic skills from kindergarten to grade three.	Overall: Low *A. Medium:* Potential covariates were entered into the analysis. Reliability of measures was not specifically reported, except in the case of child care measures. *B: Low:* The potential for child care to be conflated with Head Start, or other early intervention programs, could not be disregarded. Causality could not be inferred. *C. Low:* Child care environments were studied, however, it was unclear which child care environments were the focus (e.g. community based child care or other).	Bivariate correlations

		(teacher completed).			
Caughy et al. (1994) United States Non experimental, retrospective study	To examine the relationship between daycare participation in the first three years of life on academic readiness at ages 5 and 6.	Sample N=867. Children of participants in the National Longitudinal Survey of Youth (NLSY). Child Care Measures: *Daycare participation*: Enrolment in child care in the first three years of life, and total number of years. *Daycare type*: child's own home, in another home, or daycare centre/school. *Age of entry into daycare*: year children were first enrolled in daycare. Poverty measure: Subsidized childcare eligibility. Child Outcome Measure: *Pre-academic skills*: Peabody Individual Achievement Test (PIAT): two subscales: reading recognition; mathematics.	ANOVA and Multiple Linear Regression Participation in child care in the first three years of life was related to higher pre-academic skills at 5-6 years of age for children from impoverished home environments (both in-terms of income and quality of home environment). For impoverished home environments, the relationship between reading skills was positive and strongest when children entered child care before the child was two years of age. For mathematic skills, centre-based child care was positively related to outcomes for children from impoverished home environments.	Overall: Medium *A: Medium:* The study relied on retrospective reports by parents of child care participation, relying on parent recall of child care participation 5-6 years previously. Reliability of the outcome measure was not reported. *B: Medium:* Children did not attend Head Start (e.g. child care commences before Head Start age of eligibility). Causality could not be inferred. *C: Medium:* The intent of the research parallels the questions for the present study, however, child care as defined the authors somewhat limits the interpretation of results.	Group means, t-tests, sample sizes.
Connell et al. (2002) United States Non-experimental,	To examine the relationship between child care participation and parent-child	Sample N=47. African American, low-income kindergarten children. Intervention: Child care experiences prior to kindergarten (e.g. centers, in-	Hierarchical multiple regression Child care participation was beneficial for pre-academic skills overall, but inconsistent for social skills:	Overall: Low *A: Low:* A small sample size was apparent. The nature of children's child care experiences was unclear. The	Bivariate correlations

retrospective study	interactions on academic readiness and social skills of low-income children.	home, educational preschool). Child Care Measures: *Quantity*: Years enrolled in child care, and average amount of time in child care per week (range: less than 10 hours – more than 40 hours). Poverty Measure: Participation in free or reduced-lunch program. Child Outcome Measures: *Academic readiness*: Brigance K-1 Screen Battelle Developmental Inventory *Socioemotional development*: Walker Survey Instrument (teacher completed).	participation in child care for a longer duration (i.e. years) was associated with greater social skills; participation in more child care per week (i.e. intensity) was related to poorer social skills.	authors note that "types of facilities range from parental care…to center-based care…and educational preschool." (p. 179); it was impossible to disentangle the influence of these various child care experiences. Child care measures relied on retrospective parent report. Reliability of measures was reported. *B: Low:* The definition of child care limited the degree to which conclusions could be drawn concerning the relationship of centre-based child care to child outcomes. Causality could not be inferred. *C. Low:* The intent of the research was to examine the influence of child care regardless of type, which may or may not have included early intervention programs such as Head Start.	
Dearing et al. (2009) United States Non-experimental, prospective	To determine whether above average quality early child care moderates the relationship between socioeconomic	Sample N=1364. Participants in the National Institute of Child Health and Human Development (NICHD) Study of Early Care in middle childhood. Intervention: Early	Multilevel regression models Higher quality child care was related to the achievement of low-income children in middle childhood. Higher quality childcare	Overall: Medium *A: Medium:* Detailed description of sample, procedure and data collection. Potential covariates were entered into the analysis. Reliability of most measures was	Results not presented in a form to allow for calculation of effect sizes.

study	status and achievement in middle childhood.	nonmaternal child care experiences. Child Care Measures: *Quality:* Observational Record of the Caregiving Environment (OCRE). Episodes in high-quality child care were determined as above the median for each time point (or below, for low-quality care). Poverty measure: Income-to-needs ratio. Child outcome measures: 36 months: *School readiness (cognitive knowledge and skills*)– Bracken Basic Concept Scale Middle childhood: *Achievement and cognitive ability*: Woodcock-Johnson Psycho-educational Battery-Revised (broad math, broad reading, applied problems, letter-word identification, memory for sentences, picture vocabulary)	moderated the effect of low-income on child outcomes for broad math, broad reading, applied problems, and letter-word identification (i.e. the association between low-income and child outcomes lessened with each additional episode of quality child care). A pathway was presented where child care influences middle childhood achievement through enhanced school-readiness of low-income children at 36 months.	reported. *B: Medium:* Child care types could not be distinguished (quality of *all* non-maternal child care was considered, irrespective of type); it was impossible to determine the influence of quality centre based care specifically. Causality could not be inferred. A restricted range of poverty was apparent. *C: Medium:* The intent of the research was to determine how child care collectively (across types) influences child outcomes in the context of a generally socio-economically advantaged sample, which reflects a misalignment from the present study's research questions.	
Dinehart et al. (2012) United States Non-experimental,	To determine the association between quality child care and outcomes by comparing low-income 3-and 4	Sample N=164 low-income children (n=82 children with welfare status; n=82 children low-income). Intervention: Accredited or non-accredited centre-based	Multilevel modelling Enrollment in accredited centres, regardless of welfare status, was associated with improved developmental outcomes for children in	Overall: Medium *A: Medium:* A limited number of covariates were entered into the analysis. The reliability of the outcome	Group means, standard deviations, sample sizes.

prospective study	year old children with multiple risks due to welfare status, with low-income children without welfare status.	child care. Child Care Measures: *Quality*: Accreditation status of the centre (Yes/No). Poverty Measure: Welfare status and receipt of subsidized child care Child Outcome Measures: *Child Development in cognition, language, gross motor, fine motor*: Learning Accomplishment Profile-Diagnostic	comparison to children in unaccredited centres.	measure was reported. *B: Medium:* Children experiencing poverty were the focus of the study (study did not span socioeconomic spectrum). Children enrolled in Head Start were not studied. Causality could not be inferred. *C: Medium*: Centre based child care was the focus of the study in the context of a low-income sample. However, as a study intending to examine associations between child care and outcomes, the effect of child care in terms of impact was limited.	
Epsing-Andersen et al. (2012) United States, Denmark Non-experimental, prospective study (Denmark) Non-experimental, retrospective study	To determine the influence of early childhood education and care in promoting the development of disadvantaged children relative to their peers in Denmark and the United States.	Denmark Sample N=6011 (participants in the Denmark Panel Study). Intervention: Universal public child care prior to school entry. Poverty Measure: Family income Child Care Measures: *Type/Quality*: Cared for at home, low quality child care (home-based), high quality (centre-based) child care.	Ordinary Least Squares Regression Denmark: High quality child care was associated with improved reading outcomes in comparison to low quality child care at age 11; this relationship was not stronger for children experiencing poverty. United States: Preschool/centre based care was associated with improved child outcomes at school entry for children,	Overall: Medium *A: Medium:* A range of covariates was entered into analyses. Reliability of measures was not specifically reported. Limited reporting concerning how low and high quality child care is defined in Denmark. Child care quality in the United States was not directly examined (centre-based care was a proxy for quality).	Data was not provided in a format to allow for effect size calculation.

(United States)		Child Outcome Measure: *Cognitive*: Reading ability test at age 11. United States Sample N=15,587 (participants in the ECLS-K cohort study) Intervention: Early education and care experiences. Child Care Measures: *Type*: Informal care, preschool/child care centre, Head Start. Poverty Measure: Income-to-needs ratio below the poverty line Child Outcome Measures: Math and reading test developed by the National Centre for Statistics.	regardless of poverty status; this advantage was not associated with outcomes by 5th grade. Attending prekindergarten was associated with improved outcomes relative to centre-based care.	Data relied on retrospective parent report (US). *B: Medium:* Child care and preschool were conflated in some analyses. Causality could not be inferred. *C: Medium:* The focus of this research was international comparisons between countries with different child care policies, rather than the effect of child care and program characteristics specifically.	
Fuligni et al. (2012) United States Non-experimental, prospective study	To determine if educators' use of activity settings influences children's school readiness skills among low-income children attending a	Sample: N=125 classrooms (unit of analysis); N=206 children. Intervention: Public and private early learning and child care centres, and family child care homes. Poverty Measures: All classrooms examined served	Latent Class Analyses (to determine the underlying structure of activity settings from the EAS measure). Multi-Level Regressions (to determine the association between activity setting and child outcomes). Latent class analyses revealed two predominant	Overall: Medium *A: Medium:* Limited covariates were entered into analyses. Reliability of measures was reported. *B: Medium:* Child care types were conflated in analyses. Definition of poverty is sensitive to individual variation in children	Data was not provided in a format to allow for effect size calculation.

	range of programs.	low income children or made spaces available for low-income children through subsidies. Child Care Measures: *Activity setting*: Emergent Academics Snapshot Scale *Quality:* Classroom Assessment Scoring System (CLASS); Early Childhood Environment Rating Scale – Revised; Early Childhood Environment Scale – Extended. Child Outcome Measures: *School-readiness skills:* *Vocabulary:* Peabody Picture Vocabulary Test; *Math skills:* Woodcock-Johnson Tests of Achievement Applied Problems *Social-emotional behaviour*: Assessor rated scales evaluating positive and negative emotionality, frustration, persistence, and self-regulation, completed following administration of the school readiness skills.	activity setting types: "High Free-Choice" and "Structured-Balanced". Activity setting was not associated with measures of quality, or with social-emotional behaviour. Classrooms characterized by Structured-Balanced settings were related to children's vocabulary outcomes. Structured-Balanced settings were associated with teacher's greater use of scaffolding versus didactic interactions.	attending programs (i.e. poverty measure is program based rather than child based). Causality could not be inferred from this study. *C: Medium:* Associations between program features and child outcomes were demonstrated. However, the effect of centre-based child care was not the overall intent of the research.	
Geoffroy et al. (2007) Canada Non-	To explore if early child care for socially disadvantaged children is associated with	Sample N=3093 participants in the Quebec Longitudinal Study of Child Development. Intervention: Various child care experiences (child care	Hierarchical multiple regression Overall, the amount of nonmaternal care across income types was not	Overall: Medium *A. Medium:* A range of selection factors were entered into analyses as covariates.	ES presented for children in nonmaternal care relative to children in

experimental, prospective study	improved receptive language development at 4-5 years of age.	centre, relative care, in-home care, exclusively maternal care, out of home care). Child Care Measures: *Amount of nonmaternal care*: Number of hours per week in nonmaternal care in the first year of life (full-time >25 hours, part-time <25 hours). Poverty Measure: Socioeconomic status according to household income, and parental education and occupation. Child Outcome Measure: *Receptive language skills*: Peabody Picture Vocabulary Test Revised.	significantly related to receptive language skills. For children of low SES, full-time nonmaternal care was a significant predictor of receptive language development.	Reliability of the child outcome measure was reported. *B: Medium:* All types of nonmaternal care are conflated in analyses; the predominate care type was out-of-home family child care. Causality could not be inferred. *C: Medium:* The study did not intend to examine centre-based child care specifically.	maternal care.
Hall et al. (2009) United Kingdom Non-experimental, prospective study	To determine the influence of preschool quality on children with multiple risks (child level and family level).	Sample N=2857 Intervention: Preschool early childhood education and care experiences according to six types. Poverty measure: SES included as a composite family level risk. Child care measure: *Quality*: ECERS-R (global quality); ECERS-E (curricular quality); Caregiver Interaction Scale (interactional quality –	Structural Equation Model Lower cognitive ability was evident for children with multiple risks (cognitive performance was two standard deviations below average). Children were protected from family level risks by the global and curricular quality of preschools. Curricular and interactional quality protected children	Overall: Medium *A: Medium:* Limited information concerning types of preschool provision. Potential for variables not captured in the model (e.g. disability status) to influence outcomes. Reliability of measures not reported. *B: Medium:* ECEC types were not differentiated. Poverty was not specifically disentangled from other risk factors in analyses.	Data was not provided in a format to allow for effect size calculation.

		positive, punitive, permissive and detached factors) Child Outcome Measure: *Cognitive development*: British Ability Scales	from child-level risk.	Causality could not be inferred. *C: Medium:* This study focused on early childhood and education experiences broadly within the context of quality, and not centre-based child care.	
Jeon et al. (2010) United States Non-experimental, prospective study	To examine the global quality of ECEC settings and the quality of children's individual experiences in these settings, and to relate these experiences to child outcomes.	Sample N=138 Intervention: ECEC settings: Head Start, community-based child care, preschool. Poverty Measure: Income below poverty line. Child Care Measures: *Global quality:* Early Childhood Environment Rating Scale (ECERS-R) *Individual quality experiences*: Items adapted from ECERS-R *Structural quality*: Teacher education, training and experience; smaller class sizes. *Teacher-child relationships*: Student-Teacher Relationship Scale Child Outcomes: *Social Skills*: Social Skills Rating System (teacher report) *Language and Cognitive Skills*: Receptive Language: Peabody	Ordinary Least Squares Regression Global child care quality served as a foundation for children's individual experiences in child care. Individual quality ratings were associated with smaller class sizes. ECERS-R (global and individual) ratings were related to greater teacher education and higher salaries. Individual quality experiences and global quality were associated with positive outcomes: ECERS-R adapted score predicted teacher-child relationships and social skills; ECERS-R predicted children's social skills. PPVT-III and Woodcock-Johnson applied problems were unrelated to	Overall: Low *A: Medium:* Covariates were included to isolate the influence of child care on child outcomes. Reliability of measures was reported. The sample was one of convenience. *B: Low:* Head Start, community based child care and preschool are conflated (child care type cannot be disentangled). Causality could not be inferred. *C: Low:* The intent of the study was to examine early learning and child care types together, including early intervention, rather than separately; as such, the unique influence of child care centres was not the focus of the research.	Bivariate correlations

		Picture Vocabulary Test – Third Edition Early Math: Woodcock-Johnson Revised Test of Achievement (applied problems subset). High scores are positive for child outcome measures.	quality.		
Loeb et al. (2007) United States Non-experimental, retrospective study	To examine the relationship between preschool early childhood education and care experiences and child outcomes among a representative sample of children, and to explore whether these associations vary according to social class and ethnicity.	Sample N=14,162 (data drawn from the ECLS-K) Intervention: Non-Head Start and Head Start centre-based ECEC experience. Poverty Measure: Lowest income quartile of sample; income-to-needs ratio of 0.5. Child Care Measures: *Type:* Non-Head Start, Head Start centre-based ECEC experience, parental care, non-parental care (e.g. relative care, babysitter). *Age of Entry:* First year of entry into centre-based care. *Intensity:* Number of hours of child care per week. Child Outcome Measures: *Math and Reading Ability:* National Centre for Education (NCES) administered math and reading ability assessments. *Social-Behavioural Skills*:	Ordinary Least Squares Regression Centre-based care increased children's reading and math skills, and behavioural problems in comparison to parental care, regardless of income status, except for the most impoverished children (income-to-needs ratio of 0.5). For children who experienced the greatest poverty, the influence of centre based child care is stronger than for other income groups. For age of entry into child care and across income groups, stronger reading and math abilities are apparent for earlier entry into child care (2-3 years of age). The opposite is evident for behaviour problems.	Overall: Medium *A: Medium:* A range of covariates was entered into analyses. Reliability of measures was not specifically reported. Child care measures relied on retrospective parent report. *B: Medium:* Child care type conflated across analyses (i.e. centre-based, non-Head Start programs include child care centres, nursery schools, or Pre-Kindergarten programs). Causality could not be inferred. *C: Medium:* Centre based child care was not the primary focus, representing incongruence between the intent of the research and the present study's questions.	Data was not provided in a format to allow for effect size calculation.

		Teacher reported social skills.	Intensity of child care benefits the reading ability of children from low-income groups only when they attend for more than 30 hours/week; there is no relationship between intensity and social-behavioural outcomes for the lowest income children. When all incomes are considered, intensity benefits reading and math skills, and increases behaviour problems.		
Loeb et al. (2004) United States Non-experimental, prospective study	To explore the types of child care available to women in the welfare system, and examine how the type and quality of child care influences children's cognitive, language, and social development.	Sample N=451 children of participants in a welfare-to-work program. Intervention: Centre-based child care and home-based child care. Poverty Measure: Welfare or low-income status (mean income=$1008/month). Child Care Measures: *Child care type*: Centre-based care, licensed family child care home, no nonparental care. *Stability*: Number of child care providers used; months of attending child care arrangements. *Global quality*: ECERS	Ordinary Least Squares Regression Use of centre-based child care was associated with higher levels of cognitive proficiency relative to parental care. For social development, the use of family child care was associated with increases in behavioural problems relative to other care-types and parental care. Child care quality positively predicted school readiness and social outcomes; stability of child care had a positive effect on cognitive	Overall: Medium *A: Medium:* A range of covariates were entered into analyses. Measures were described in detail, however, the reliability of most measures was not reported. *B: Medium:* Causality could not be inferred. *C: Medium:* The effect of child care in the context of poverty, according to multiple parameters was explored. The study did not intend to examine the impact of child care per se.	Data is not reported in a format to allow for ES calculation.

		(centres); FDCRS (family child care homes); Arnett Scale of Caregiver Behaviour *Structural measures of quality*: Child-to-staff ratios, maximum group size, number of child care groups, caregiver education level. Child Outcome Measures: *School readiness*: Family and Child Care Experiences Survey (FACES); *Cognition*: Items adapted from the National Household Education Survey (mother assessed). *Cognitive and language proficiency*: Bracken Basic Concept Scale *Social development*: Child Behaviour Checklist	outcomes and social outcomes. Caregiver education was positively related to school-readiness and cognition.		
McCartney et al. (2007) United States Non-experimental, prospective study	To examine whether quality of child care is a protective factor for children experiencing low income.	Sample N=1364 (original sample). Participants in the National Institute of Child Health and Human Development (NICHD) Study of Early Care at 36 months of age. Intervention: Early child care experiences. Child Care Measures: *Quality:* Observational Record of the Caregiving Environment (OCRE).	Multiple regression High quality child care was associated with positive outcomes for children experiencing poverty; child care protected children from the effects of poverty. For children experiencing poverty, children in higher quality child care scored highest on school readiness (cognitive measure), expressive language, and receptive language,	Overall: Medium *A: High:* Detailed description of sample, procedure and data collection. A range of covariates were entered into the analysis. Reliability of child care and outcome measures was reported. *B: Medium:* Centre based child care is conflated with other forms of nonmaternal care. A restricted range of poverty was apparent.	ES for children experiencing poverty participating in child care.

		Children who were in non-maternal child care were classified as participating in high quality or low quality care (according to mean quality measures). Poverty measure: Income-to-needs ratio. Child Outcome Measures: *Cognitive*: Bracken Basic Concept Scale (School Readiness composite) *Language*: Reynell Developmental Language Scale (two subscales: receptive and expressive language).	compared to children in low-quality child care or no child care. Low quality child care had a protective influence from the experience of poverty for receptive and expressive language. The experience of high quality child care was associated with improvements in the home environment for low-income children, which in turn was associated with improved child outcomes.	Causality could not be inferred. *C: Medium:* The intent of the research was to determine how child care (across types) influenced child outcomes in the context of a generally socio-economically advantaged sample, which reflects a misalignment from the present study's research questions. Child care was placed within an ecological context that demonstrates the influence of high quality child care on home environments, which in turn influenced child development outcomes.	
Magnuson (2004) United States Non-experimental, retrospective study	To examine associations between early child care experiences and child outcomes for children who do and do not experience disadvantage.	Sample: N=12,804 Intervention: Centre based early childhood education and care. Child Care Measures: *Type*: Centre based care: Prekindergarten, Head Start, and preschools, nursery schools, and day care centres. Poverty Measure: Income-to-needs ratio. Child Outcome Measures: Math and reading test	Ordinary Least Squares Regression Children who experienced centre-based early childhood education and care in their prekindergarten year performed at a higher level than children without these experiences, and were less likely to be retained in kindergarten. For children experiencing poverty, higher math and reading scores were associated with attending	Overall: Medium *A: Medium:* A range of covariates was entered into analyses. Reliability of measures was reported. Child care measures relied on retrospective parent report. *B: Medium:* Child care centres are primarily conflated with preschools and nursery schools in analyses. Causality could not be inferred.	Data not presented in a format to allow for ES calculation.

		developed specifically for the Early Childhood Longitudinal Study-Kindergarten (ECLS-K) study; grade retention (kindergarten).	any type of centre-based care, however, the association was greatest for children participating in prekindergarten programs.	*C: Medium:* Centre based child care was not the primary focus of the study.	
NICHD (2001) United States Non-experimental, prospective study	To provide a picture of the early experiences of children who would be eligible for Head Start (children below the poverty line), and to determine if child care experiences are related to developmental outcomes.	Sample N=1364 (original sample) Child Care Intervention: Child care experiences according to a range of child-care factors (e.g. type, quality, quantity). Child Care Measures: *Type*: Centre, family child care home, father/partner, in-home care by a non-relative, relative). *Quantity and Stability of Care*: Amount of time in non-maternal care; age of entry into care; number of starts in child care settings. *Quality*: Observational Record of the Caregiving Environment (OCRE). Poverty measure: Income-to-needs ratio. Child outcome measures: *Behavioural measures:* Adaptive Social Behaviour Inventory subscales; Child Behaviour Checklist items. *Cognitive functioning*: Reynell Developmental	MANOVA/Linear Regression In relationship to child outcomes, child care quality and amount were examined (type was used in analyses concerning utilization, but not relative to child outcomes). Amount of child care was found to be statistically non-significant for cognitive and social outcomes, but was related to mother reports of child health (children in part-time or full-time care were rated as less healthy than children experiencing no child care). Quality child care was not related to behavioural outcomes, but was related to cognitive and language outcomes. Children experiencing higher quality child care fared better than children experiencing poor quality child care with respect to cognitive outcomes.	Overall: Medium *A: Medium:* Reliability of child care quality measures was reported, but not child outcome measures. Covariates for the examination of child care quality were not entered into analyses. It was unclear whether quality was related more to centre-type or home-based care. *B: Medium:* Inclusion of high-poverty participants was limited (i.e. subsample of children experiencing poverty and near-poverty, and who also attended home or centre-based child care for >20 hours/week, was small; n=79). Type of child care as it related to quality was difficult to delineate (e.g. centre vs. home-based child care), confounding the two child care types. Causality could not be inferred from this study.	Data was not provided in a format to allow for effect size calculation.

		Language Scales; Bracken Basic Concept Scale *Growth and Health*: Overall health rating (mother reported); height, weight.		C: *Medium:* Centre based child care was not the primary focus of the study.	
NICHD (2002) United States Non-experimental, prospective longitudinal study	To determine whether child care is related to positive or negative child outcomes prior to formal school entry, and to address whether these effects are statistically meaningful.	Sample N=1364 (original sample) Child Care Intervention: Child care experiences according to a range of child-care factors (e.g. type, quality, quantity) Child Care Measures: *Type*: Primary care arrangement (centre, child care home, in-home, grandparent, father, exclusively maternal). *Quantity:* Amount of time in non-maternal care. *Quality*: Observational Record of the Caregiving Environment (OCRE). Poverty Measure: Income-to-needs ratio; poverty operationalized as income-to-needs 2.0 or lower. Child outcome measures: *Pre-academic:* Subtests of the Woodcock Johnson Achievement and Cognitive Batteries (Letter-Word Identification; Applied Probems) *Short-term memory:*	Multivariate linear regression Quantity (30 hours or more/ week) was associated with greater risk of behaviour problems. Higher quality was associated with higher preacademic and language skills. Centre care was associated with greater language and memory performance. Interactions were not present between child care variables, or income-to-needs ratios, indicating the independence of these child-care factors, regardless of children's poverty status.	Overall: Medium *A: High:* Detailed description of sample, procedure and data collection. A range of covariates were entered into the analysis. Reliability of child care and outcome measures was reported. *B: Medium:* Centre based child care is conflated with other forms of nonmaternal care. Limited range of poverty was apparent (e.g. sampling did not ensure high risk families were included), and, overall a relatively SES advantaged sample. Causality could not be inferred. *C: Medium:* The intent of the research was to determine how child care quality, amount, and type influenced child outcomes, reflecting a close alignment with the present study's research questions. As research examining associations, the effect of child care in the context of impact is	ES data presented for quantity, quality, and type of child care.

		Woodcock Johnson Coginitive Memories for Sentences subtest *Language competence:* Preschool Language Scale *Social competence:* Two measures: Social Skills Rating System (mother completed); California Preschool Social Competency Scale (caregiver completed for children attending child care) *Behaviour problems*: Child Behaviour Checklist (mother and caregiver completed)		not apparent.	
Rappolt-Schlitmann et al. (2009) United States Experimental, prospective study	To determine the effect of small group experiences and teacher-conflict on cortisol levels in children attending a high quality child care centre.	Sample N=60 Intervention: Small group setting in a high quality child care centre. Poverty Measure: Income-to-needs ratio. Child Care Measures: *Group setting:* Small group vs. large group. Researchers created a small group setting with one other child, a teacher, and researcher (35 min.); group setting of typical daily activities. *Child-teacher conflict:* Student-Teacher Relationship Scale Child Outcome Measures:	Individual Growth Modelling Children with a higher mother-conflict relationship had higher levels of cortisol compared to children with lower mother-conflict relationship; these levels of cortisol were likewise less likely to decrease quickly in comparison to low mother-conflict relationships. Children in a small group setting experience had reduced cortisol levels in comparison to children in the typical child care environment, however, these levels were higher for children who had higher	Overall: Medium *A: Medium:* The sampling frame was one of convenience (i.e. child care centre with a long-standing research relationship with the authors). However, random assignment to participation in the experiment was evident. *B: Medium:* The experimental nature of the study allows for some causal inferences to be drawn, however, these inferences are limited; the small group setting is artificial and may not be generalizable to other group settings. *C: Medium:* Child care is embedded in an ecological context with parent-child	Data was not provided in a format to allow for effect size calculation.

		Stress-functioning: Cortisol levels	teacher-conflict relationships.	relationships. Facets of quality are examined in a setting of high global quality. The impact of centre-based care was not the focus of the study per se, but settings within the context of centre-based care.	
Tran et al. (2011) United States Non-experimental, prospective study	To explore the association between stability of centre-based on child care arrangements and outcomes among a low-income sample of children.	Sample N=3238 Intervention: Centre based ECEC experiences. Poverty Measure: Receipt of subsidy to attend centre-based child care. Child Care Measure: *Stability*: Teacher or centre change from beginning to end of a school year. Child Outcome Measures: *Cognitive and language skills:* Learning Accomplishment Profile-Diagnostic. *Socio-emotional skills and behaviour problems:* Parent and teacher-reported assessments: Devereux Early Childhood Assessment.	MANOVA Children generally made gains in cognitive and language skills regardless of teacher or centre stability. Children's language skills were higher for children who changed centres during the academic year in comparison to children whose centres remained stable. Children who experienced a change in teacher experienced a decrease in teacher-reported behaviour problems throughout the course of the year. Children who remained with the same teacher demonstrated higher teacher-reported initiative and adult closeness than children who changed teachers.	Overall: Medium *A: Medium:* Limited demographic information was available for the entire sample. Reliability of outcome measures was reported. *B: Medium:* Child care was conflated across types (e.g. for-profit child care, non-profit child care, preschool programs); Head Start centres were excluded from analyses. Causality could not be inferred. *C: Medium:* Specific nuances of centre based care (centre or teacher change) were the focus of the study, rather than centre-based care per se.	Means, standard deviations, total sample size.

Votruba-Drzal et al. (2004) United States Non-experimental, prospective study	To examine the relationship between extent, type, and quality of child care on children's development at preschool age.	Sample N=204 Intervention: Child care experiences in early childhood. Poverty Measure: Participants were part of a larger project, the Three-City Study; income <200% of poverty line. Child Care Measures: *Quality:* ECERS (centre-based); FDCRS (home-based); Arnett Scale of Provider Sensitivity. *Quantity*: Number of weeks in child care *Type*: Centre care or home-based care. Child Outcome Measures: *Cognitive*: Woodcock-Johnson Psycho-Educational Battery Revised (Applied Problems and Letter-Word Identification subtests). *Socioemotional functioning*: Child Behaviour Checklist (mother report); positive behaviour scale.	Ordinary Least Squares Regression Child outcomes do not vary by child care type. No significant relationships between child care quality and the development of quantitative and reading skills were found. Child care amount was modestly related to cognitive outcomes. Child care quality was strongly related to socioemotional outcomes, with increased quality related to reductions in the rates of internalizing and externalizing behaviour.	Overall: Low *A: Medium:* A range of covariates were entered into the analysis. Reliability for child care quality and socio-emotional outcomes was reported. *B: Low:* Types of child care centres were conflated (e.g. Head Start and community based child care settings). Causality could not be inferred. *C: Low:* The effect of naturally occurring, centre based child care was not the focus of the study.	Data is not reported in a format to allow for ES calculation.
Votruba-Drzal et al. (2010) United States	To gain examine the relationship between early child care	Sample N=349 Intervention: Home and centre-based child care experiences.	Lagged ordinary least squares regression Controlling for type and extent of child care, children	Overall: Low *A: High:* A range of covariates were entered into analyses.	Data is not reported in a format to allow for ES calculation.

Non-experimental, prospective study	experiences and behaviour development in middle childhood.	Poverty Measure: Participants were part of a larger project, the Three-City Study; income <200% of poverty line. Child care-measures: *Quality:* ECERS (centre-based); FDCRS (home-based). *Quantity*: Number of weeks in child care *Type*: Centre care or home-based care. Child Outcome Measures: *Behaviour Problems*: Child Behaviour Checklist (mother report).	in higher quality child care developed fewer behavioural problems; the opposite was evident for children in lower quality child care. Type and quantity of child care were unrelated to the development of behavioural concerns in middle childhood.	Reliability for child care quality and socio-emotional outcomes was reported. *B: Low:* Although not stated, Head Start centres are likely included under the umbrella of "centre care" (see Vortuba-Drzal, 2004). Causality could not be inferred. *C: Low:* The effect of naturally occurring, centre based child care did not appear to be the focus of the study.	
Winsler et al. (2004) United States Non-experimental, prospective study	To examine the school readiness gains made by children at 4.5 years of age relative to their participation in centre-based community child care settings or public pre-kindergarten.	Sample N=3838 participants in the Miami School Readiness Project. Intervention: Community based child care centres and public prekindergarten. Poverty Measure: Subsidy receipt; family income <150% of the federal poverty line. Child Care Measures: *Type:* Participation in full-time centre-based child care or full-time public prekindergarten. Child Outcome Measures: *Cognitive, language, and fine*	MANOVA Mixed Linear Models Children in centre based care began their prekindergarten year at a disadvantage compared to children enrolled in public prekindergarten or fee-supported preschool; however, children in centre based care made significant gains by the end of their prekindergarten year in the area of cognition. Gains were also evident in language, fine motor skills, and socioemotional skills, with no increase in	Overall: Medium *A: Medium:* Limited demographic information was available for the entire sample, restricting the degree to which confounding factors could be controlled for. Reliability of measures was reported. *B: Medium*: Child care and public preschool enrolment were considered separately. Children enrolled in Head Start were not included in the study, allowing for the relative influence of child care to be separated.	ES standard gains presented according to participation in program type.

		motor skills: Learning Accomplishment Profile-Diagnostic. *Social-emotional protective factors and behaviour*: Devereux Early Childhood Assessment (mother and teacher completed).	behavioural concerns. Children in public prekindergarten programs made more gains in cognitive and language domains relative to children in community based settings.	Causality could not be determined. *C: Medium:* The effect of child care in terms of impact was not the intent of the study.	
Zaslow et al. (1998) United States Non-experimental , retrospective study	To examine the associations between attendance in centre-based early childhood education and care programs and child outcomes for children in a sample receiving welfare.	Sample: N=182 Intervention: Centre-based child care experiences. Poverty Measure: Applied for or receiving welfare. Child Care Measures: Participation in a centre-based early childhood education and care program. Child Outcome Measures: *School readiness*: Caldwell Preschool Inventory. *Social adjustment*: Personal Maturity Scale (mother report).	Ordinary Least Squares Regression Participation in centre-based programs was associated with improved school readiness, but not with social adjustment. Centre-based child care did not influence social adjustment in a positive or negative manner (children in participating in centre-based programs and those without centre-based experiences displayed similar levels of social adjustment).	Overall: Medium *A: Medium*: A range of covariates were entered into the analysis. Reliability of measures not reported. Child care measures rely on parent report. *B: Medium:* Child care centres, nursery schools and preschools were conflated in analyses; Head Start was examined separately. *C: Medium:* The effect of child care for children experiencing poverty was the intent of the research, aligning with the present study's questions. The research did not intend to examine the effect of child care in terms of impact.	Data is not reported in a format to allow for ES calculation.

Broad Summary of Studies Included in the In-Depth Review

Weight of Evidence. With the exception of one study (Rappolt-Schlitmann et al., 2009), all studies in the in-depth review were non-experimental in nature (N=24), limiting the degree to which the impact of child care on child outcomes for children experiencing poverty could be determined. The majority of studies were of average quality, prospectively examining the effect of child care on child outcomes, while seven out of 25 studies relied on retrospective parent report. The finding that most studies were methodologically sound may have reflected the inclusion of only peer-reviewed research, which may have served as a quality appraisal mechanism (Gough et al., 2012).

The majority of studies received an overall weight of evidence rating of medium (N=19), while six studies were appraised as low. Two studies assigned an overall weight of evidence rating of low were likewise appraised low in terms of soundness of the research (generic quality). No studies received an overall weight of evidence rating of high. This phenomenon was a result of challenges to the relevance of the research in answering the present study's questions. Child care types were typically conflated in analyses, posing a challenge to separate the effects of centre based child care from other forms of nonparental care. Further, in cases where child care types were not conflated in analyses (e.g. Burchinal et al., 1996), the study design itself was not appropriate in determining causal relationships.

Child Care Measures. Child care quality was predominately the child care measure of focus. Quantity of child care and type of child care were additional primary areas of focus. Child care was compared within categories of interest: low quality child care was considered relative to high quality child care, centre-based child care was considered relative to home-based care or prekindergarten, and low amounts of child care were considered relative to high amounts

of child care. Control groups for children experiencing no child care were absent in all studies, however, child care was considered relative to maternal care in some studies. All studies explored the link between child care in early childhood and child outcomes.

Child Outcomes. A range of outcomes were examined focusing on the cognitive, language, and behavior domains, in addition to pre-academic or academic achievement. The majority of studies examined the association between early child care experiences and outcomes prior to kindergarten, while two studies focused on outcomes in middle childhood, and one on outcomes in infancy.

Poverty Measures. All studies included a measure of poverty or low socio-economic status. Poverty was defined on a continuum from highly impoverished in samples with incomes less than 200% of the poverty line to 200% above the poverty line for near-poverty groups. Poverty measures for cohort studies were embedded in the socioeconomic spectrum from low to high socioeconomic status. For samples comprised solely of children experiencing poverty, samples were typically drawn from larger longitudinal, prospective studies examining low-income groups. There were 14 studies examining the effect of child care on child outcomes for children experiencing poverty that were wholly low-income samples, while 11 studies examined the effect of child care on child outcomes for impoverished children as part of larger cohort studies spanning the socioeconomic spectrum.

Data Analysis and Findings. The majority of studies included in the in-depth review were observational studies of the relationship between child care and child outcomes. Data analyses typically reflected this in study authors' use of regression with covariates to isolate the influence of child care on outcomes. High quality child care was consistently related to positive

child outcomes, while behavioural development was less consistently related to child care measures, and depended on the outcome measure used.

The Magnitude of the Effect of Child Care on Child Outcomes

Effect Size Calculation

Individual standardized mean difference effect sizes were calculated for each child care and outcome measure where data allowed. This approach ensured a common metric for examining the influence of child care on child outcomes among the range of statistical analyses presented in Table 4.1; however, the determination of effect sizes was constrained by the study-level data reported.

Standardized mean differences were mined from studies through a variety of methods. Several studies presented standardized mean difference effect size data reported as *d* specifically (Geoffroy et al., 2007; McCartney et al., 2007; NICHD, 2002; Winsler et al. 2004). The standardized mean difference for the remainder of the studies were determined from raw data reported in the form of means, standard deviations, and sample sizes (Ansari et al., 2012; Dinehart et al., 2012l; Tran et al., 2011), transformations of bivariate correlations (Burchinal et al., 1996; Burchinal et al., 2006; Connell et al., 2002; Jeon et al., 2010), or transformation of independent t-tests, standard deviations, and sample sizes (Caughy et al., 1994). Individual effect sizes are presented in Table 4.2, where ES_{sm} is denoted as *d*.

Table 4.2. Effect size calculation for child care measures and associated outcomes within studies.

Study	Comparison	Outcome Domain and Effect Size
Ansari et al. (2012)	Centre based child care relative to family child care homes.	Behaviour concerns (parent report): *d*= 0.0 Behaviour concerns (teacher report): *d*= -0.20 Social skills (parent report): *d*=0.02 Social skills (teacher report): *d*= -0.19 Cognitive skills: *d*= 0.04 Fine motor skills: *d*=0.13

		Language skills: *d*=0.08
Burchinal et al. (1996)	Children in high quality child care relative to children in low quality child care.	Cognitive Development: *d*=0.77 Receptive Language: *d*=0.56 Expressive Language: *d*=0.41 Communication and Symbolic Behaviour: *d*=0.63
	High teacher education relative to low teacher education.	Cognitive Development: *d*=0.39 Receptive Language: *d*=0.26 Expressive Language: *d*=0.58 Communication and Symbolic Behaviour: *d*=0.41
	High infant-adult ratio relative to low infant-adult ratio	Cognitive Development: *d*= - 0.49 Receptive Language: *d*= - 0.56 Expressive Language: *d*= - 0.20 Communication and Symbolic Behaviour: *d*= - 0.82
	Large class size relative to small class size	Cognitive Development: *d*= - 0.16 Receptive Language: *d*= - 0.28 Expressive Language: *d*= - 0.32 Communication and Symbolic Behaviour: *d*= - 0.28
Burchinal et al. (2006)	High quality early child care relative to low quality at Kindergarten.	Social Skills: *d*=0.47 Behaviour Concerns: *d*= - 0.45 Reading Skills: *d*=0.16
	High quality early child care relative to low quality at Grade One.	Math Skills: *d*=0.30 Social Skills: *d*=0.35 Behaviour Concerns: *d*= - 0.37
	High quality early child care relative to low quality at Grade Two.	Reading Skills: *d*=0.47 Math Skills: *d*=0.04 Social Skills: *d*=0.18 Behaviour Concerns: *d*= - 0.22
	High quality early child care relative to low quality early child care at Grade Three.	Reading Skills: *d*=0.47 Math Skills: *d*=0.35 Social Skills: *d*=0.14 Behaviour Concerns: *d*= -0.41
Caughy et al. (1994)	Child care experience relative to no child care in the first year of life.	Reading Recognition: *d*=0.35
	Child care experience relative to no child care in the second year of life.	Reading Recognition: *d*=0.51
	Child care experience relative to no child care in the third year of life.	Reading Recognition: *d*=0.47
Connell et al. (2002)	More child care hours per week relative to fewer child care hours	Academic Readiness: *d*=0.06 Social Skills: *d*= -0.45

	per week (intensity)	Cognitive Skills: *d*= 0.65 Communication Skills: *d*=0.12 Receptive Communication: *d*=0.22
	More years in child care relative to fewer years in child care (duration)	Academic Readiness: *d*=0.45 Social Skills: *d*=0.41 Cognitive Skills: *d*=0.58 Communication Skills: *d*=0.65 Receptive Communication: *d*=0.80
Dinehart et al. (2012)	Children in accredited centres relative to children in non-accredited centres.	Overall development for low-income children: *d*=0.78 Overall development for children in the welfare system: *d*=0.58
Geoffroy et al. (2007)	Nonmaternal care relative to maternal care.	Language: *d*=0.58
Jeon et al. (2010)	High global quality child care relative to low global quality child care. High quality individual child care experiences relative to low quality individual child care experiences.	Receptive language: *d*=0.35 Early math skills: *d*=0.14 Social skills: *d*=0.47 Receptive language: *d*=0.41 Early math skills: *d*=0.14 Social skills: *d*=0.56
McCartney et al. (2007)	High quality child care relative to no child care Low quality child care relative to no child care	School Readiness: *d*=0.41 Receptive Language: *d*=0.40 Expressive Language: *d*=0.35 Receptive Language: *d*=0.23 Expressive Language: *d*=0.18
NICHD (2002)	High amounts of child care relative to low amounts of childcare High quality child care relative to low quality child care Centre based child care relative to home-based child care	Behaviour Concerns: *d*=0.43 Preacademic skills: *d*=0.39 Language: *d*=0.29 Language: *d*=0.41 Memory: *d*=0.41
Tran et al. (2011)	Change in centre relative to centre stability Change in educator relative to educator stability	Cognitive skills: 0.09 Language skills: 0.19 Cognitive skills: -0.14 Language skills: -0.16
Winsler et al. (2004)	Community child care centres across time.	Cognitve: *d*=0.33 Language: *d*=0.52 Fine Motor: *d*=0.32 Socioemotional: *d*=0.26 Behaviour Concerns: *d*=0.04

Applying Cohen's (1988) guidelines for the interpretation of effect size data, these effect sizes range from small to large. However, the interpretation of these effect sizes is tempered by the qualitative interpretation of the meaning of child care relative to child care measures and child outcome measures, in addition to the comparison of effect sizes from community based child care relative to early intervention programs specifically designed to serve low-income children. The interpretation of effect sizes will be further explored in Chapter Five.

Meta-Analytic Inquiry

In an effort to clarify the influence of child care on child outcomes for children experiencing poverty, a meta-analytic inquiry was undertaken to explore the cumulative evidence of the influence of child care on child outcomes. Chapter three noted that the calculation of a mean effect size was iterative, and determined by the homogeneity of the studies included in the study. As in the determination of individual effect sizes, the computation of a single mean effect size was limited by the data presented in individual studies. The studies which presented effect size data (Geoffroy et al., 2007; McCartney et al., 2007; NICHD, 2002; Winsler et al. 2004) were excluded from the meta-analysis because the inverse variance weight could not be determined for these studies. As a result, eight studies were included in the meta-analytic inquiry.

Weighted effect sizes were averaged within and across studies, and are illustrated in Figure 4.2. The cumulative effect size mean using such an approach is g=0.08, however, due to the high degree of heterogeneity between the studies as indicated by the Q-statistic ($p<0.0001$), there is little meaning to be extrapolated from such an approach. In other words, as a result of the variability between studies, combining all study results into a single effect size mean merely demonstrates the differences within and across studies.

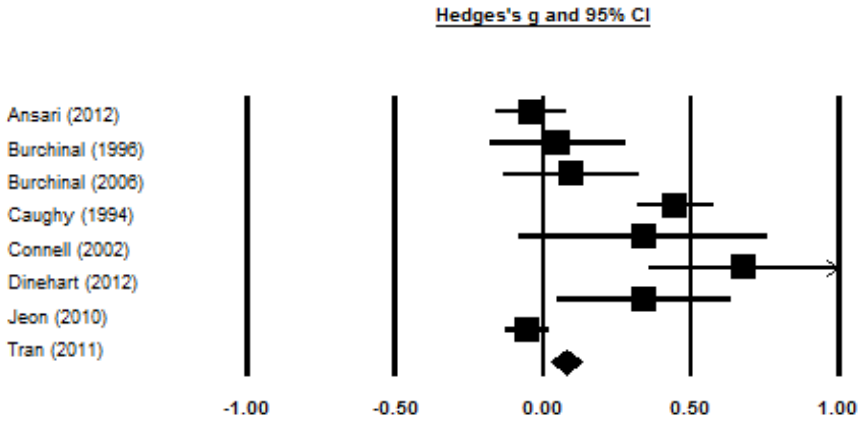

Figure 4.2. Forest plot of effect sizes expressed as Hedges' g.

Examination of Table 4.2 reveals the variation between studies in terms of context and outcome measures. This range of contexts and measures is further captured by Figure 4.2. However, despite the variation between studies, quality emerges as one broad category of child care measure that may be explored as a common facet of the influence of child care on child outcomes (Burchinal et al., 1996; Burchinal et al., 2006; Dinehart et al., 2012; Jeon et al, 2010). To explore the cumulative evidence of the influence of quality on child outcomes, a meta-analytic inquiry was performed to determine the cumulative effect of high quality child care on cognitive-linguistic, social, and behavioural outcomes separately. These results, and the level of significance for the corresponding *Q*-statistic, are presented in Table 4.3.

Table 4.3. The cumulative effect size mean of the influence of high quality childcare on child outcomes.

Domain	Effect Size Mean (Hedge's *g*)	Q-Statistic Level of Significance
Cognitive-Linguistic	0.41	0.20
Social Skills	0.37	0.22
Behaviour Concerns	-0.36	1.0

Cognitive-linguistic outcomes were combined for four studies (Burchinal et al., 1996; Burchinal et al., 2006; Dinehart et al., 2012; Jeon et al, 2010), social skills across two studies

(Burchinal et al., 2006; Jeon et al., 2010), and behavioural concerns within one study (Burchinal et al., 2006). The *Q*-statistic demonstrates the homogeneity of variances across studies, perhaps not surprisingly in that the Burchinal et al. studies examine the same population longitudinally (Burchinal et al., 1996; Burchinal et al., 2006). According to conventions established by Cohen (1988), this meta-analytic inquiry suggests that high quality child care is moderately associated with improved cognitive-linguistic and social outcomes, and moderately reduced behavior concerns, relative to children in low quality child care among children experiencing poverty.

Characteristics of Programs Associated with Positive Developmental Outcomes

An additional question of this thesis was to determine which child care program characteristics were associated with positive child outcomes. Although the answer to this question will be further discussed in chapter five, the characteristics of child care programs associated with positive child development is inherently the sum of parts as captured in the systematic review, effect size computation, and meta-analytic inquiry. However, child care quality as defined by researchers surfaces as the predominate focus of characteristics associated with positive child outcomes for children experiencing poverty, variously captured in structural terms of adult to child ratios and group sizes (Burchinal et al., 1996; Dinehart et al., 2012), to process quality measures (Bassock et al., 2008; Burchinal et al., 1996; Burchinal et al., 2006; Dearing et al., 2009; Hall et al., 2009; Jeon et al, 2010; McCartney et al., 2007; NICHD, 2001; NICHD, 2002; Votruba-Drzal et al., 2004; Votruba-Drzal et al., 2010).

CHAPTER FIVE: DISCUSSION

This thesis explored the impact of child care on outcomes for children experiencing poverty through a systematic review and meta-analytic inquiry. The sections in this chapter seek to answer the four central questions pertaining to the potential for child care to act as a naturally occurring intervention. The first section explores the state of literature base of child care as a means of supporting developmental outcomes for children experiencing poverty. The second section examines the effect of child care on child outcomes, and the magnitude of this effect. Characteristics of programs that support optimal child development are explored in the next section, followed by an interpretation of the effect of child care on outcomes within Bronfenbrenner's (1979) ecological theory of development. Lastly, directions for future research and limitations of the present study are advanced.

The State of the Published Literature Base

The state of the published literature base revealed that exploration of the impact of child care in the lives of children experiencing poverty is an understudied phenomenon. Of the 11,158 titles, abstracts, or full documents reviewed, 24 were included in the in-depth review, representing less than one percent of the total number of studies identified by the search terms. One study was identified from reference review, leading to 25 studies ultimately included in this thesis. Further, of these 25 studies, four were drawn from the NICHD Study of Early Child Care, (Dearing et al, 2009; NICHD, 2001; NICHD, 2002; McCartney et al., 2007) three from the ECLS-K, (Epsing-Anderson et al., 2012; Magnuson, 2004; Loeb et al., 2007) three from the Miami School Readiness Project (Ansari et al, 2012; Tran et al., 2011; Winsler et al., 2004), two from a study of otitis media (Burchinal et al., 1996; Burchinal et al., 2006), and two from the

Three-City Study (Votruba-Drzal et al., 2004; Votruba-Drzal et al., 2010). As a result, the unique data sets examining the impact of child care is reduced to 16.

When early learning and child care is viewed as an intervention for disadvantaged children, it is generally done within the context of programs contrived specifically as early intervention programs (N=129; exclusion criterion three). Further, the vast majority of literature reviews examining the functioning of early learning and child care in the lives of disadvantaged children did so in the framework of early intervention programs designed for impoverished children (N=13; exclusion criterion eight). In contrast, less is known to the extent which community based child care programs, where a substantial portion of children from low-income families are cared for, support developmental outcomes (Winsler et al, 2008).

Compounding the complexity of determining the impact of child care on child outcomes is the unexpected degree to which researchers conflated centre-based child care with other forms of early childhood education. This conflation renders it difficult to isolate the effects of child care from the influence of public pre-kindergarten and Head Start, each of which have unique funding and policy streams (Magnuson et al., 2004; OECD, 2006). The primary aim of this thesis sought to examine the effect of centre-based child care on child outcomes for children living in poverty specifically. This disconnect between the research questions posed by this thesis, and the broad definition of early learning and child care applied by researchers, was one of the greatest limiting factors in assigning a high weight of evidence for studies included in the in-depth review.

Further, with the exception of one experimental study which examined the effect of reduced child-adult ratios on the cortisol production of low-income children (Rappolt-Schlitmann et al., 2009), all studies were non-experimental explorations the association of child

care as defined by the authors on child outcomes. This finding further limits the weight of evidence afforded to the studies included in this thesis. While studies examining associations are not inherently flawed or unsatisfactory, the extent to which conclusions may be drawn about the impact child care is constrained by the potential of uncontrolled variables influencing child outcomes (McCartney et al., 2007). The impact of child care in this discussion should be viewed through the lens that the evidence converges to demonstrate that child care, under the right conditions, positively influences developmental outcomes for children living in poverty.

The Effect of Child Care on Child Outcomes and Effect Size Magnitudes

The Average Effect of Child Care: Meta-Analytic Inquiry

In this thesis, the average effect of child care on children experiencing poverty was explored in two manners. First, an average effect size was computed for all studies where data permitted. This approach led to a small average effect size of g=0.08. However, computing an average effect size in this way revealed little more than the differences within and across studies, ranging from child care measures capturing type (e.g., Ansari et al., 2012) to structural quality (e.g., Burchinal et al., 1996), and cognitive (e.g., Dearing et al., 2009) to behavioural (e.g., Votruba-Drzal et al., 2010) outcomes. As this diverse range of measures suggests, the heterogeneity apparent in this approach was too great to allow for conclusions to be drawn.

Second, an average effect size was calculated for similar outcome and child care measures. Average effect sizes were computed for the impact of high quality child care on cognitive-linguistic, social, and behavioural outcomes, and were determined to be g=0.41, g=0.37, and g= -0.36 respectively. The homogeneity of variances across studies was acceptable for each outcome measure, suggesting the studies included in the high quality meta-analytic inquiry were comparable. High quality child care, regardless of the measure used to define

quality, is associated with moderately improved cognitive-linguistic and social outcomes, and reduced behavioural concerns for children from impoverished backgrounds. However, although representing separate primary studies, there were dependencies in the datasets in cognitive-linguistic outcomes as a result of the longitudinal nature of the Burchinal et al. (1996) and Burchinal et al. (2006) studies, limiting the interpretation of this average effect size (Lipsey & Wilson, 2001).

Considering the constraints in interpretation of the average effect of child care on child outcomes presented in this meta-analytic inquiry, these results should be viewed as exploratory. A rich interpretation of the effect of child care on developmental outcomes may further be gleaned from the cumulative evidence presented in the systematic review and individual study level effect size data.

The Effect of Child Care on Behavioural Outcomes

The effect of child care on behavioural outcomes emerged as a common theme in the literature. Child care was demonstrated to have a positive, negative, or benign influence on behavioural outcomes. The magnitude of this effect ranged from d=0.43, reflecting a moderate increase in poor behavioural outcomes for children who experienced more hours of child care relative to their peers not in childcare (NICHD, 2002), to d= -0.41 for children in high quality child care relative to children without such experiences (Burchinal et al., 2006). Examination of the cumulative evidence gathered in the systematic review provides some reconciliation of these disparate findings.

The systematic review, as discussed in the previous section, includes several studies that examine large cohorts of children. The NICHD (2002) study, for example, was comprised of a sample of children from diverse economic backgrounds, however, the degree to which low-

income children who likewise experienced non-maternal child care is questionable. The sampling scheme excluded families in high-risk neighbourhoods, parents under the age of 18, and those not conversant in English, and as a whole, reflected a largely economically advantaged group (NICHD, 2002). The same cohort at three years of age who experienced poverty or near-poverty conditions and who also experienced child care for at least 20 hours per week was determined to be small relative to the sample as a whole, totaling 79 out of 1364 children (NICHD 2001, NICHD 2002). The NICHD (2002) study did not find interactions between income, child care measures, and child outcomes, suggesting that quantity of child care exerted a similar negative influence across income groups. Further, the negative influence of the quantity of child care was present, regardless of quality or type of child care experience. The conclusion drawn from the authors is that child care conferred developmental risk in the behavioural domain (NICHD, 2002).

Alternatively, behavioural outcomes were examined in large cohort studies with a greater proportion of children experiencing both child care and poverty than the NICHD (2002) sample, or studies exclusively focusing on children experiencing poverty. For these children, child care acted as a protective (Burchinal et al., 2006; Tran et al., 2011; Votruba-Drzal, 2004; Vortruba-Drzal et al., 2007; Winsler, 2004), or harmless factor to behavioural outcomes (Loeb et al., 2007; Zaslow et al., 1998). However, the protective force of child care on behavioural outcomes does not hold constant by mere experience of child care. In these studies adequately representing low-income populations, high quality child care predicted better behavioural outcomes. These results suggest that behavioural outcomes are sensitive to the population under study, and appear to differentially impact children according income level. For children experiencing poverty, the

focus of this thesis, child care buffers children from the behavioural sequelae of economic disadvantage under the right conditions.

The Effect of Child Care on Cognitive and Language Outcomes

The impact of child care on child outcomes for the cognitive and language domains demonstrates considerable variability. However, like behavioural outcomes, examination of the facets of child care impacting cognitive and language outcomes offers some resolution to these conflicting findings. High quality, discussed further in the next section on the characteristics of programs related to positive developmental outcomes, surfaces as a factor that promotes positive development. Echoing Sameroff et al.'s (1993) findings of cumulative risk, poor quality child care enacts a less positive influence in the lives of impoverished children.

The nebulous concept of child care quality may be broadly considered along two dimensions: structural and process quality (NICHD, 1996). Structural quality refers to features of child care settings that are fixed and regulatable, such as child-to-staff ratios, education levels of staff, and group size (Johnson, Tarrant, & Brooks-Gunn, 2008). Process quality defines the content of children's experience in child care, and includes interactions between children themselves, and between children and educators (Johnson et al., 2008). These two aspects of quality are not mutually exclusive, and vary with each other (Johnson et al., 2008). Process quality is argued to exert a greater influence on children's development than structural quality (Johnson et al., 2008), however, the results of this thesis suggest that structural quality is as important to children's development as process quality (Burchinal et al., 1996 ; Dinehart et al., 2012; Loeb et al., 2004).

Burchinal et al. (1996) examined the influence of structural quality measures on developmental outcomes in infants. Caregiver education, infant-to-staff ratio, and group size

were studied in relationship to cognitive and language outcomes. Burchinal et al. (1996) demonstrated that high infant-to-staff ratios had a large and negative influence on language development, with a magnitude of *d*= -0.82. Burchinal et al. (1996) postulated that more children per staff limited the interactions between children and their educators, hampering the opportunity for educators to support and extend children's language skills. A similar negative effect was found for cognitive development, however, to a lesser and moderate degree (*d*= -0.49). Higher educated caregivers were associated with a strong, and positive effect on children's language (*d*=0.58) and cognitive (*d*=0.39) outcomes, while large class sizes were related to poorer language (*d*= -0.32) and cognitive (*d*= -0.16) outcomes relative to smaller class sizes. Consistent with Burchinal et al.'s (1996) findings, Dinehart et al. (2012) revealed a similar large and positive effect of a centre's accreditation status, the nature of which reflects programs of high structural quality (Johnson et al., 2008), on developmental outcomes.

Similarly, high process quality positively impacted children's cognitive and language outcomes (Burchinal et al., 1996; Burchinal et al., 2006; Dearing et al., 2009; Hall et al., 2009; McCartney et al., 2007; NICHD, 2001; NICHD, 2002;). In the Burchinal et al. (1996) study, the effect size for the influence of high process quality child care relative to low was large at *d*=0.77. Further, this effect persisted overtime, with children experiencing high process quality in early childhood possessing greater math and reading skills from first grade through third, with effect sizes in the moderate range (Burchinal et al., 2006). Further, McCartney et al. (2007) demonstrated that low quality child care was related to positive language outcomes relative to no child care experience, although the magnitude of this effect was markedly smaller for low quality in comparison to high quality (*d*=0.18 and *d*=0.35, respectively).

Although quality emerged frequently as a defining factor in children's cognitive and linguistic outcomes, centre based care relative to other care types (Ansari et al., 2012; Epsing-Andersen, 2012; Loeb et al, 2004; Loeb et al, 2007; Magnuson, 2004; NICHD, 2002; Zaslow et al., 1998), and greater intensity of child care experience (Geoffroy et al, 2007; Votruba-Drzal, 2004) were also related to positive outcomes. However, relative to prekindergarten programs, where quality is suggested to be higher than in community centre based care, stronger cognitive and linguistic outcomes were evident (Epsing-Andersen, et al. 2012; Magnuson et al, 2004; Winsler et al., 2004).

Assessing the Practical Significance of Effect Size Magnitudes

Cohen (1988) offered conventions for the interpretation of small, medium, or large effect sizes. However, these conventions are guidelines, and Cohen (1988) advised that the interpretation of effect sizes should be considered in the context of prior research and theory. Further, Cohen (1988) suggested that effect sizes for social research typically falls in the small range, whereas large effect size magnitudes are sought for fields such as experimental psychology, where there is a high degree of methodological control. In educational research, Hattie (2009) interprets an effect size of d=0.40 as practically meaningful, while Ramey and Ramey (2004) contend that an effect size of 0.25 is a benchmark for changing practice. Guided by Cohen's (1988) recommendations, child care as a naturally occurring intervention (or a negative intervening factor, depending on the nature of the study) will be discussed in relationship to previous research on early intervention programs (Anderson et al., 2003; Ramey & Ramey, 2004) and in the context of d=0.25 to d=0.40 as a guideline for programs enacting a positive influence in children's well being (Ramey & Ramey, 2004; Hattie, 2009).

Anderson et al. (2003) undertook a systematic review to examine the impact of early childhood development programs on children's cognitive, social, and health outcomes. Included in their review were several studies examining the impact of Head Start, the Abecedarian Project, and the Perry Preschool program. Effect sizes were consistently strong and positive in the cognitive domain, with a high of d=2.2, a large and practically meaningful magnitude. The research on which this effect size was based studied the impact of the Perry Preschool program, which provided high-quality preschool to socially disadvantaged children (Schweinhart, Weikart, & Larner, 1986). In terms of raw scores, this translated to a difference of 22 IQ points after experiencing one year of preschool programming (Schweinhart et al, 1986). Similar large effect sizes were found in the cognitive domain for the Abcedarian Project, with an average of d=1.45 between 18 months and 4.5 years of age (Anderson et al., 2003; Ramey & Ramey, 2004).

In the present research, the largest effect size in the cognitive domain was determined to be d=0.77 (Burchinal et al., 1996). However, the effect size for cognition was also found to be as low as d= -0.49, where poor structural quality is evident (Burchinal, et al., 1996). As discussed previously, the protective force of child care hinges on the quality of the program. This effect is at once important in practice because of the positive influence child care may be in the right circumstances for children, and, by the same token, the negative influence child care may be in the lives of children. In terms of the benefits of child care on cognition, the effect size, although of practical importance, is less than the magnitude of the effect size of model child care programs (Anderson et al., 2003; Ramey & Ramey, 2004).

This finding may be the result of a number of reasons, the most significant of which may be that the majority of the studies included in this thesis are non-experimental studies. In determining the effect sizes for the present research, child care is not isolated from confounding

factors, and there was an absence of experimental control in the studies included in this thesis that is otherwise evident from studies of model child care programs. Alternatively, the strength of the benefits of child care may be less profound than in model early childhood programs because the quality in community child care programs is dilute in comparison. The effect sizes, however, in the cognitive domain for studies examining high quality are similar for this thesis and Head Start programs (Andersen et al., 2003). The finding that child care may have the potential to improve cognitive outcomes according to the interpretation of effect sizes in educational research and in a magnitude similar to a well-known federal program for children experiencing poverty is compelling (Ramey & Ramey, 2004; Hattie, 2009).

Characteristics of Programs Supporting Optimal Child Development

Quality

Characteristics of child care programs supporting optimal child development are a detailed reflection of process and structural quality. Quality child care was defined at the outset of this thesis as developmentally appropriate practice (Copple & Bredkamp, 2009). However, in the research presented in this thesis, quality surfaced according to the child care measures used to capture this broad concept.

Structural quality. Specific structural quality child care measures were examined in this thesis, however, to a lesser degree than process quality . Structural quality characteristics of high quality programs include low child-infant ratios (Burchinal et al., 1996), smaller group sizes (Bruchinal et al., 1996; Rappolt-Schlitmann et al, 2009), and higher educated child care providers (Jeon et al., 2010; Loeb et al., 2004). These structural features of child care quality may operate as a foundation for process quality measures, and further, exert a considerable negative influence when they are not in place (Burchinal et al., 1996).

Process quality. Observational measures of child care environments are based on the notion of process quality (Johnson et al., 2008). Several observational measures capturing process quality were used in the research included in this thesis, predominately the Observational Record of the Caregiving Environment (OCRE; Dearing et al., 2009; McCartney et al., 2007; NICHD, 2001; NICHD, 2002), the Early Childhood Envrionment Rating Scale (ECERS; Bassock et al., 2008; Burchinal et al., 2006; Loeb et al., 2004; Votruba-Drzal et al., 2004; Votruba-Drzal, 2010) or Early Childhood Environment Scale-Revised (ECERS-R; Fuligni et al., 2012; Hall et al., 2009; Jeon et al., 2010), and the Infant Toddler Rating Scale (ITERS; Burchinal et al., 1996; Burchinal et al., 2006).

These instruments collectively represented positive child-educator interactions as a central feature of child care programs supporting optimal child development. The OCRE was developed for the NICHD Study of Early Child Care, and represents individual children's experiences with their educators in a child care setting (NICHD, 1996; NICHD 2001). The OCRE captures the qualitative content and frequency of child-educator interactions, including dimensions such as sensitivity, responsiveness, and stimulation of cognitive development. Studies evaluating child care quality through the OCRE have revealed positive associations between these facets of quality and cognitive, language, and academic achievement outcomes (Dearing et al., 2009; McCartney et al., 2007; NICHD, 2001; NICHD, 2002). Further, the positive influence of sensitive, responsive, and cognitively engaging child-educator interactions persisted from early childhood (McCartney et al., 2007; NICHD, 2001; NICHD, 2002) to middle childhood (Dearing et al., 2009).

The ECERS measures patterns of child-educator interaction at the program level, rather than providing a child-specific measure of individual quality (NICHD, 1996), and is a

cornerstone for the development of the ECERS-R and ITERS (Harms, Clifford, & Cryer,1998; Burchinal et al., 1996). Program quality is evidenced by the ECERS according to materials and activities to support children's development, daily schedule, supervision, and use of space, corresponding to seven subscales: personal care routines, furnishings and display, language-reasoning experiences, fine and gross motor activities, creative activities, social development and adult needs (Harms & Clifford, 1983). The ECERS-R is an iteration of the ECERS that incorporated evolving notions of best practice, but retains the fundamental quality dimensions of the ECERS (Harms et al.,1998). The ECERS-R captures underlying characteristics of the early learning environment and child-educator interactions (Cassidy, Hestenes, Hegde, Hestenes, & Mims, 2005). Lastly, the ITERS is an adaptation of the ECERS for child care settings comprised of infants and toddlers (Burchinal et al., 1996).

In this study, high scores on these environment ratings scales were indicative of high process quality at the program level, which in turn supported optimal child development. In other words, when children living in poverty had early child care experiences that were characterized by responsive, positive child-educator interactions, where children experienced an environment imbued with language and creative activities, and where there was ample opportunity for educator-supported play, their cognitive, language, and social development was nurtured from infancy to middle childhood (Burchinal et al., 1996; Burchinal et al, 2006; Hall et al., 2009; Jeon et al, 2010; Loeb et al, 2004; Votruba-Drzal et al., 2004). However, like structural features of child care, these elements of process quality are a *double-edged* (Stouthamer-Loeber et al., 1993) presence in child care environments, where poor quality environments lead to compromised developmental outcomes.

Linking the Impact of Child Care to Bronfenbrenner's Ecology of Human Development

A theoretical context may further explain the process by which development occurs, and at what level a change in practice will alter the course of development. Bronfenbrenner's (1979) ecological theory of human development provides a framework for understanding why child care experiences profoundly influence development at the child-level, and how system change can broadly alter children's experiences, instigating developmental change for many children.

The Child Care Microsystem: Actualizing Change at the Child-Level

The microsystem represents the developmental context of a child's interactions with her immediate environment (Bronfenbrenner, 1979). Bronfebrenner (1979) contends that a child's development within the microsystem occurs within molar activities, interpersonal structures, and roles. Molar activities, either occurring in solitude or jointly with another individual, includes those elements of the environment possessing momentum through time. Many of the experiences of a child in a child care setting are defined by molar activities, such as construction play, or digging in the sand (Bronfebrenner, 1979). Interpersonal structures are the relationships between a child and others in her environment, the most fundamental being the dyad, which serves as building blocks of the microsystem (Bronfenbrenner, 1979). An interpersonal structure may be evidenced in a child care setting through a reciprocal, affective relationship between a child and educator. An educator reading a picture book with a child (Bronfenbrenner, 1979), or extending and scaffolding a child's play constitute interpersonal structures. Roles are the expectations assigned, implicit or explicit, to an individual that influences the content of activities and the nature of the relationship between a child and others (Bronfenbrenner, 1979). The differentiation between a parent and educator is an example of a role (Bronfenbrenner, 1979).

Bronfenbrenner (1979) postulated that human development occurs within complex interrelationships between molar activities, interpersonal structures, and roles:

> The development of a person is a function of the substantive variety and structural complexity of the molar activities engaged in by others who become part of the person's psychological field either by involving her in joint participation, or by attracting her attention. (p.55)

The findings of this thesis echo Bronfenbrenner's (1979) statement. The substantive activities of a child care program, and the interactions of children and their educators, surfaces as a defining developmental influence for children experiencing poverty. Further, depending on the nature of this experience, child care exerted a positive or negative impact on developmental outcomes.

Program factors influencing positive child development capture the molar activities children experience with their educators. The evidence in this thesis converges to demonstrate that high process program quality has a positive developmental impact on children. Facets of the measure of process quality are the components of the early learning environment available to children to support the acquisition of new skills and concepts. The child care environment is the third teacher, arranged intentionally to facilitate children's learning with opportunities to engage in various activities and with a range of materials (Fraser & Gestwicki, 2002). Aligning with Bronfenbrenner's (1979) ecological theory, this thesis supports the notion that quality programs are important in children's optimal development (Burchinal et al., 1996; Burchinal et al, 2006; Hall et al., 2009; Jeon et al, 2010; Loeb et al, 2004; Votruba-Drzal et al., 2004).

However, perhaps more salient are the interactions of children and their educators (Bronfenbrenner, 1979). Responsive, warm, stable relationships with educators serve as an important context for child development (McCartney et al., 2007; NICHD, 2001; NICHD, 2002;

Tran et al., 2011), with this effect persisting across time (Dearing et al., 2009). Significantly, the quality of these child-educator relationships are as powerful as the quality of the home environment in determining developmental outcomes (NICHD, 2002). Although the role of educator and parent are distinct (Bronfenbrenner, 1979), positive child-educator interactions serve to shape the cognitive and language development of children in a parallel manner. Bronfenbrenner (1979) suggested that children form a primary-dyad with an individual where a strong affective relationship is present which continues to "exist phenomenologically for both participants even when they are not together…[such that] two members appear in each other's thoughts, are the objects of strong emotional feelings, and continue to influence one another's behavior when they are apart" (p.58). It is conceivable that a child and her educator can form such a relationship that supports positive development and serves as a protective factor in the context of poverty.

The Child Care Macrosystem: Enacting Societal Change to Alter Child Development

The research in this thesis provides insight into the macrosystem's powerful effect on child development. Broad based change at the macrosystem level will produce change at the child-level, not for one child, but for many children. The influence of the macrosystem is evident in the dichotomy between child care and public prekindergarten programs. Child care programs, compared to prekindergarten programs, are fundamentally different in resources and recognition (OECD, 2006). Child care is commonly perceived as custodial (Albanese, 2007), and a private family responsibility (Beach et al, 2008; OECD, 2006). Child care educators experience poor compensation, require less education, and do not enjoy the same status of their counterparts in the public prekindergarten system (OECD, 2006). This societal division of roles, and the public versus private structures of public prekindergarten and child care programs

likewise emerges in different developmental outcomes between children (Epsing-Anderson et al., 2012; Magnuson et al., 2004; Winsler et al., 2004).

A systematic examination of outcomes for children in public prekindergarten relative to community child care was beyond the scope of this thesis, however, three studies suggest that developmental outcomes for children in prekindergarten programs are relatively superior to child care programs (Epsing-Anderson et al., 2012; Magnuson et al., 2004; Winsler et al., 2004). Prekindergarten was associated with improved math and reading, language, and cognitive outcomes relative to children in community child care (Epsing-Anderson et al., 2012; Magnuson et al., 2004; Winsler et al., 2004). Winsler et al. (2004) determined the effect size for community child care on cognitive and language outcomes for children living in poverty to be d=0.33 and d=0.52 respectively, and the same measure to be d=0.55 and d=0.64 for public prekindergarten. Although the magnitude of the effect size for child care indicates that these programs are associated with positive and meaningful change (Hattie, 2009; Ramey & Ramey, 2004), these results suggest that the macrosystem that separates child care and public prekindergarten favours children experiencing prekindergarten.

Intuitively, system-wide change at the macrosystem level will compel change within the microsystem. This synergistic relationship between the macrosystem and microsystem is like a wave pushing and receding from the shore. The push of macrosystem change, for example, altering societal beliefs about child care or regulatory forces that shape structural and process quality requirements, will support children's developmental outcomes. Cyclically, the microsystem components of responsive, sensitive relationships, and stimulating learning environments will instigate positive developmental outcomes, and pulse outwards to reinforce the value of early learning and child care.

The Mesosytem and Exosystem

The influence of child care on the mesosystem and exosystem featured less prominently in this thesis because of the focus on child outcomes, however, avenues for future research may be gleaned from this research. For example, McCartney et al. (2007) noted improvements in the quality of the home environment were observed for children who participated in high quality child care. The authors considered this observation may have occurred as a result of parenting skills parents may have acquired through interacting informally with early childhood educators (McCartney et al., 2007). Applying Bronfebrenner's (1979) ecological theory, experience of quality child care altered the mesosytem between parent and child care program, in turn influencing the microsystem of the child's home environment.

As plausible, however, is that the microsystem of child-educator interactions in child care altered the interpersonal structure of the child's relationship with her parent in the child-parent microsystem. For children living in poverty, improved behavioural and social outcomes are associated with high quality child care (Burchinal et al., 2006; Votruba-Drzal et al., 2004; Votruba-Drzal et al., 2010). Perhaps improved behaviour and social skills instigate change in the parent-child dyad, leading to improved quality of the parent-child relationship. This speculation is supported by the observation that child care is associated with decreases in parent-reported behaviour concerns (Votruba-Drzal et al., 2004; Votruba-Drzal et al., 2010). Future research will need to further explore the link between child care and the home environment.

Further Directions for Future Research

In addition to examining the influence of child care on the mesosystem and exosystem, several areas for future research emerged from this thesis. As noted in the state of current research, an unexpected finding of this thesis was the degree to which child care was conflated

with other early childhood programs. Several lines of research may be pursued from this finding. First, the question emerges whether it is useful to consider centre-based child care separately from other forms of early childhood education in research. The policy streams driving child care, public prekindergarten, and Head Start are distinct (Magnuson et al., 2004; OECD, 2006), and there is evidence child outcomes vary according to program type (Epsing-Anderson et al., 2012; Magnuson et al., 2004; Winsler et al., 2004). Future research will need to disentangle the relative influence of child care from other forms of early childhood programs.

Second, and related to the entanglement of various forms of early childhood programs, future research may need to explore how researchers' interpretations of child care influence study design, results, and application in policy and practice. For example, several studies conflate child care and Head Start, despite Zigler and Styfco's (2004) assertion that Head Start is not child care (e.g., Jeon et al., 2010). Other studies separate Head Start from analyses of centre-based programs (e.g., Loeb et al., 2007), and others yet that were excluded from this thesis explicitly define Head Start as a child care program (e.g., Burchinal, Nelson, Carlson, & Brooks-Gunn, 2008). These various definitions serve to confuse and fragment the meaning of child care. Future researchers may consider undertaking a narrative inquiry to deconstruct how child care is defined in research, and how these definitions are woven into the macrosystem.

An additional area for future research concerns the effect of child care on biological outcomes. Rappolt-Schlitmann et al. (2009) examined the impact of group size, a structural measure of quality, on developmental outcomes for children within the context of a high process quality program. The authors determined that children who participated in a small group setting experienced reductions in cortisol levels compared to a large group setting. Further, the experience of cortisol reductions in the small group setting was moderated by educator-child

relationships. Children with an educator-child relationship marked by conflict were less likely to experience a drop in cortisol levels in a small group setting than children without a conflictual relationship with their educator. These results are intriguing because they represent the presence of embedded miscrosystems. The experience of shifting group sizes within a high process quality program and the enduring mental affective presence of an educator-child relationship melded to impact cortisol levels.

This paucity of research on the impact of child care on biological outcomes may represent the macrosystem emphasis on school readiness outcomes which is prevalent in the United States (OECD, 2006), where the majority of these studies were drawn. This perspective neglects the holistic view of children, with biology intricately linked to cognition, emotion, and learning (Mossier, 2013). Cortisol, a byproduct of stress, has a deleterious impact on the developing brain, rendered more damaging in the absence of a supportive adult relationship (Mossier, 2013). Rappolt-Schlitman et al.'s (2009) research may be a point of departure for future research examining the intricate functioning of stress, child care setting, and relationships within ecological systems.

Lastly, it is a task of future researchers to determine whether there is a causal relationship between naturally occurring centre-based child care and child outcomes. Although the evidence presented in this thesis suggests a causal relationship, in the absence of randomized control trial studies, definitive conclusions cannot be drawn (McCartney et al, 2007; Oliver & Peersman, 2001). However, given the preponderance of evidence demonstrating the impact of model educational child care programs (Anderson et al., 2003; Campbell et al., 2001, Ramey & Ramey, 2004), the effect of centre-based child care programs revealed in this study, and the potential for such programs to support the developmental outcomes for many children, is compelling.

Limitations of the Present Research

The limitations of this thesis are twofold: limitations inherent in the studies themselves, and those of the systemtatic and meta-analytic methodology applied. As noted in the state of the published literature base section, child care was conflated within several studies included in the in-depth review. This conflation, along with the absence of experimental data, limits the conclusions that may be drawn. Further, the majority of studies were of average rather than high quality. Limitations of the studies themselves evident in study design and reporting is threaded throughout the systematic review, and attenuates the findings of this thesis.

Several limitations emerged from the methodology used in this thesis. Although this thesis may be considered systematic in the use of transparent methods, the scope of the research base searched was limited to published, peer-reviewed journals. This restriction provides a narrower perspective on the functioning of child care as a naturally occurring intervention for children experiencing poverty. Similarly, although the search terms used were sensitive, as evidenced by the over 11,000 titles, abstracts or full documents reviewed for this thesis, there it is a possibility that the search terms were not exhaustive. In addition, the meta-analytic inquiry is limited in interpretation because of dependencies in the data sets (Lipsey & Wilson, 2001). A further limitation of this thesis is that it was carried out by a single researcher, and was a solitary pursuit. Systematic reviews are more authentic with the involvement of a review team (Gough et al., 2012).

Implications and Conclusion

A systematic review and meta-analytic inquiry was applied to explore the impact of child care on outcomes for children experiencing poverty. The evidence presented in this thesis converges to demonstrate that child care acts as a naturally occurring intervention under

conditions of high quality. In the context of poor quality, child care acts as a negative intervening factor and exerts a detrimental influence. This finding situates child care as a service that has the potential to produce effects that are similar to early childhood programs designed specifically for low-income children. Child care as a naturally occurring intervention necessitates educators and policy-makers to *tread softly*, thoughtfully, and responsively to support low-income children's optimal development.

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(*indicates inclusion in the in-depth review)

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APPENDIX A: Inclusion and Exclusion Criteria

Studies meeting the following inclusion and exclusion criteria will be included in the systematic review:

1. The study concerns the provision of centre-based child care on child well-being, and the study is evaluative, demonstrating the impact or relationship of centre-based child care on child outcomes.
2. The study focuses on children living in poverty.
3. The study is not a model child care program designed as an intervention for impoverished children, or any other intervention program specifically developed for children living in poverty with a child-care component.
4. The study focuses on the provision of child care in early childhood, from 0-6 years of age.
5. The study is published in English.
6. The study is published after 1993.
7. The study is reported as a scholarly peer reviewed journal article.
8. The study is primary research and not a review.
9. The analysis is reported quantitatively.

APPENDIX B: Search Terms

1. "early childhood education"
2. "early learning"
3. childcare
4. "child care"
5. daycare*
6. "day care*"
7. "infant care"
8. nurser*
9. "family cent*"
10. "integrated cent*"
11. prekindergarten*
12. "pre-kindergarten*"
13. preschool*
14. pre-school*
15. "play school*"
16. playschool*
17. "play group*"
18. "playgroup*"
19. creche*.
20. "mother and toddler group*”
21. "parent and toddler group*"
22. (child* adj3 (centre* or center* or program*))
23. "early education"
24. "child development"

25. "early care"

26. poverty

27. impoverish*

28. poor

29. "low* income"

30. low-income

31. ((economic* or socio-economic* or socioeconomic* or social*) adj5 (disadvantage* or status))

32. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25

33. 26 or 27 or 28 or 29 or 30 or 31

34. 32 and 33

APPENDIX C: Coding Protocol

Source	
1. Study ID Number	
2. Bibliographic Reference	
3. Publication Year	
4. Country	
Methodological Descriptors	
5. Sample Size	
6. Research Design	
7. Approach to Data Analysis	
8. Weight of Evidence A. Soundness of study B. Appropriateness of the study design and analysis for answering review questions C. Match between the intent of the study and the review questions	Low-Medium-High
9. Poverty Measure	
10. Child Care Measures	
11. Outcome Measures	

Substantive Program Descriptors	
12. Description of Child Care Experience	
13. Summary of Authors' Findings	
Effect Size Coding	
14. Effect Size Type	1. Post-test Comparison
	2. Comparison of Group Differences
	3. Correlation
15. Effect Size Statistic	1. ES_{sm}
	2. ES_{pd}
	3. ES_{r}
16. Category of Outcome (Well-being) Measure	1. Cognitive
	2. Social
	3. Behavioural
	4. Language
	5. Academic
	6. Other
17. Effect Size Data-Extraction	1. Means and Standard Deviations
	2. *t* value
	3. Bivariate Correlations
	4. Frequencies or proportions
	5. Other (specify):